EPA Comments Portland Harbor RI Report – Baseline Human Health Risk Assessment

No.	Section and Page Number	Comment	Comment Type
General – 1	NA	The draft Portland Harbor Baseline Human Health Risk Assessment (BHHRA) includes numerous statements regarding the fish consumption rates used to evaluate the risks to human health. The three primary non-tribal fish ingestion rates used in the draft BHHRA are characterized as high (17.5 grams per day [g/day]), higher (73 g/day), and highest (142 g/day). EPA disagrees with this characterization, believes them to be misleading, and believes that significantly higher ingestion rates may be appropriate to represent different local and ethnic populations that rely on fishing as part of their culture and/or as a substantial food source. As such, the three ingestion rates presented in the BHHRA should be characterized as low, moderate, and high. The rate of 17.5 g/day (equivalent to two 8-ounce meals per month) is based on the 90th percentile rate for uncooked freshwater and estuarine finfish and shellfish for individuals (consumers and non-consumers) of age 18 and over in the United States (EPA 2002b, data from USDA CSFII Study). The 90th percentile for fish consumers only from this USDA study is much higher, at 200 g/day. EPA uses the 17.5 g/day rate to approximate a fish-consuming population that does not include tribal or subsistence fishers. It is not an unreasonable rate, and should not be referred to as a high ingestion rate, but rather as a low ingestion rate. A non-tribal adult fish consumption rate of 73 g/day was used in this risk assessment based on data from the Columbia Slough. The possible uncertainties associated with the consumption rates derived from this study are appropriately discussed in the BHHRA. The BHHRA discussion and the data from the USDA study support use of a fish consumption value of 73 g/day as moderate consumption rate, not a higher consumption rate. The rate of 142 g/day used as the highest rate for non-tribal fishers in the draft BHHRA is the 99th percentile for consumers and non-	Directed Change

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		consumers from the same USDA study; the consumption rate for consumers only from this study is 506 g/day. The ingestion rate of 142 g/day is used by EPA in developing Ambient Water Quality Criteria (AWQC) for consumers who obtain much of their daily protein from fish. The consumption rate of 142 g/person/day was selected in the BHHRA to represent high-frequency, non-tribal fishers, and represents an appropriate "high" ingestion rate for the Portland Harbor (PH) risk assessment. Overall, the arguments concerning uncertainties in fish ingestion rates provided in the HHRA are not compelling. Further, EPA believes that the body of information available regarding fish consumption rates, both nationally and locally, makes it clear that the fish ingestion rates used in the BHHRA appropriately address a range of exposures that might occur for consumers of locally caught fish. Please revise text throughout the document to indicate the nature of these risk estimates, as indicated above, and substitute appropriate text to acknowledge the need to protect high consuming fish populations and discuss fish ingestion rates in that context.	
General – 2	NA	Although the extent of shellfish consumption in the Lower Willamette River is not known, certain information regarding the consumption of shellfish in the Lower Willamette River is available. The Oregon Office of Environmental Public Health, Department of Health Services (DHS) had previously received information from Oregon Department of Fish and Wildlife (ODFW) indicating that an average of 4,300 lbs of crayfish were commercially harvested from the portion of the Willamette River within Multnomah County in each of the 5 years from 1997 to 2001. Most of this catch was sold to the Pacific Seafood Company of Oregon. DHS also has information from local commercial crayfish harvesters indicating that Europe is a major portion of their market. Furthermore, as part of the McCormick and Baxter assessment in 1991, information obtained by DHS from the Oregon Crayfish	Note

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		Association indicated that the area around McCormick and Baxter was at one time a very productive crayfishery. It is likely that harvesting crayfish in the PH site has declined because of the advisory and because this stretch of the river was designated as a Federal Superfund site. In addition to the historical information regarding commercial crayfish harvesting in the Lower Willamette, DHS also occasionally receives calls from citizens interested in harvesting crayfish from local waters who are interested in fish advisory information. Between 2001 and 2007, DHS fielded eight calls from citizens who reported catching and eating crayfish from Portland-area waters (only one was specifically from the Study Area). DHS has no way of knowing what percent of individuals who catch and eat crayfish contact their office first to ask for fish advisory information. They estimate that for each person who contacts them regarding the safety of consuming crayfish from the Lower Willamette, there are many more who catch and consume the animals without contacting their office. The fact that collection of *Corbicula* is illegal is relevant but not particularly important for the pathway in general. Indications are that *Corbicula* are being collected and consumed to some extent (e.g., from the Linnton Community Center's discussion with transients). It is reasonable to assume that bivalve consumption is a current and potential future exposure pathway and that future biomass would increase. Therefore, the low clam mass that may limit current bivalve consumption does not apply to future exposure.	
General – 3	NA	In the draft BHHRA, the calculation of a chronic hazard index (HI) for each exposure pathway is not presented in the risk characterization tables (Section 5 tables). Per EPA's Risk Assessment Guidance (Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A), the chronic HI for each exposure pathway	Clarify

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		should be added to these risk characterization tables in the final HHRA. In addition, only those exposure pathways which have a chronic HI greater than 1 should be included in tables that show the calculation of the End-Point Specific HIs. Unnecessary tables totaling hundreds of pages that are now included in the draft BHHRA can and should be eliminated when HI are appropriately reported.	
General – 4	NA	Numerous statements are included in the draft HHRA regarding the compounding of conservative risk assumptions, which resulted in the LWG concluding that the final risk characterization results are unreasonable. This issue is also highlighted in the LWG's October 8, 2009, letter. EPA disagrees with this characterization. The approach used in this BHHRA follows standard EPA guidance on risk assessments and is similar to risk assessment approaches used on other Superfund sites. Overall, EPA believes the risk assessment for Portland Harbor is consistent with the application of reasonable maximum exposure assumptions and is not overly conservative. Further discussion on this issue is included in specific comments. EPA objects to certain language and information included in the discussion of uncertainties in the BHHRA. For example, in the presentation of uncertainty, the range of variation in HIs is greatly overstated. This is because each toxic endpoint in an exposure scenario is considered independently. Instead, each scenario should be evaluated based on the chemical(s)/endpoint combination resulting in the greatest HI. For example, in Table 5-186, the HI range for tribal fisher direct exposure to in-water sediment across all half-mile segments is listed as 0.00000008 to 1. This range is developed using the very lowest chemical/endpoint combination (naphthalene causing whole body effects) to the highest chemical/endpoint combination (arsenic causing skin effects). The lowest HI for a scenario is irrelevant for decision making; decisions are based on the highest calculated HI at each location. The correct range for tribal fisher sediment exposure should	Directed Change

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		be developed using the highest chemical/endpoint combination at each location (Table 5-36). This range is 0.002 (arsenic, skin effects) to 1 (dioxin toxicity equivalence quotient [TEQ], reproductive effects). In this example, the HI range in Table 5-186 is overstated by a factor of 25,000. This overstatement of HI uncertainty is typical of many other scenarios. However, if as described above, endpoint-specific HIs are calculated according to EPA guidance for only for those exposure pathways with a chronic HI greater than 1, all of the endpoint-specific HIs presented in Table 5-36 would be deleted from the BHHRA (an elimination of 49 pages for this one receptor/ exposure media/exposure route), as none of the exposure pathways have an HI greater than 1. This conclusion can be found on page 78 of the draft BHHRA where it states, "The tribal fisher scenario for in-water sediment results in no HIs greater than 1." The correct evaluation will need to be performed before the agencies have an appropriate view of uncertainty associated with non-cancer risks. Another uncertainty for non-cancer effects that was not discussed in the draft HHRA relates to the calculation of endpoint-specific HIs. In deriving these, only one health endpoint is used for each chemical, even though most chemicals have a myriad of health effects as exposures increase. As an example, a majority of the non-cancer impacts from the site are from PCBs and total TEQ. The endpoint used for deriving the RfD for PCBs is immunotoxicity, while the endpoint used for deriving the RfD for dioxin/furan TEQ and PCB TEQs is reproduction. In Table 5-144 (Child, Fish Consumption, Single-Species Diet, Common Carp, 95 percent UCL/ Maximum Exposure Scenario, Highest Ingestion Rate (60 g/day)), the endpoint-specific HI for total TEQ is 500, calculated using the RfD for 2,3,7,8-TCDD, which is based on a reproductive endpoint. A review of the toxicity data in the ATSDR Toxicological Profile for PCBs shows that a dose of 0.02 mg/kg/day in monkeys results in a "serious LOAEL (Lowest Observed	

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		Adverse Effect Level) for reproduction." If the reproductive endpoint for PCBs based upon the LOAEL of 0.02 mg/kg/day is used with the same Uncertainty Factor as the immunological endpoint to derive an RfD for a reproduction endpoint for PCBs, the RfD for reproductive effects will be 4 times the RfD for immunological effects. Using this ratio, the endpoint-specific HI for reproduction for this exposure scenario for PCBs would be 5,000/4 = 1,250. The total HI for reproduction effects, combining HIs for total TEQ (500) and non-dioxin-like PCBs (1,250), would increase from 500 to 1,750. For the chemicals that have the largest non-cancer contribution in the HHRA, the Uncertainty Section should discuss the possibility of under-predicting non-cancer health effects by using only one endpoint per chemical.	
General - 5	NA	There are several inappropriate discussions relating to "background" and "regional" risk levels, particularly regarding biota (game fish). EPA and the LWG agreed that biota data collected upstream of the Portland Harbor site by the LWG would not be used in the BHHRA. Therefore, no appropriate background data set for biota for Portland Harbor is available for use in the BHHRA, and any reference to background in relation to biota in the BHHRA should be deleted. EPA acknowledges our agreement to use upstream tissue data for informational purposes in the Remedial Investigation report. Comparisons are also made to risks from biota consumption in other "regional" risk studies (the EPA Columbia River Basin Fish Contaminant Survey, and the ODEQ mid-Willamette Basin study). Comparisons to these studies, which were initiated because of known or suspected contamination in the particular areas in which they were done, should not be included in the BHHRA. Comparisons to risks from other contaminant surveys are misleading as they are not relevant to the Portland Harbor Site. Background can be addressed using estimates for background sediment concentrations that are available for	Issue

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		Portland Harbor.	
General – 6	NA	Much of the language in the draft BHHRA that discusses the Willamette River as a potential future drinking water source is inappropriate. Under OAR 340-041-0340, Table 340A, domestic water supply is a designated beneficial use of the Willamette River, with adequate pretreatment. CERCLA sets out a mandate for remedies that are protective for both private and public users of surface water or groundwater. The Willamette River is potable and capable of serving as a potential drinking water source; thus, the expectation is that this resource will be protected and remediated to achieve such use (40 CFR 300.430(a)(1)(ii)(F)). This expectation is reflected in the current remedial action objectives and ARARs for the PH site and must be reflected in the HHRA for the site. Throughout the draft HHRA, where reference is made to the risk characterization done for potential future domestic use of surface water, much of the language will need to be deleted and/or modified to be consistent with the fact that surface water is potable and capable of serving as a potential drinking water source and that the expectation is that the resource will be protected and remediated to achieve such use. EPA has provided comments on this inappropriate language which occurs throughout the draft BHHRA.	Directed Change
General – 7	NA	Section 8.2, Risk Drivers, should be deleted, and Section 9, Conclusions, should be revised to summarize the chemicals and exposure scenarios that present the majority of the risk, as well as chemicals that exceed ARARs based on the evaluation presented in Section 6. These should be carried through into the FS; COCs should be identified in the FS based on the results of the BHHRA. One role of the BHHRA is to identify those chemicals that pose the greatest risks to current and future receptors, along with the media and exposures routes associated with those risks. This information is used to inform response actions.	Revise

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General – 8	NA	It is not appropriate for the BHHRA to focus on a subset of the chemicals posing potentially unacceptable risk based upon the considerations listed on pages 142-143. Inappropriate considerations include the relative percentage of each chemical's contribution to the total human health risk, uncertainties associated with exposures, frequency of detection (localized and study-area wide), comparisons of Portland Harbor site risk to risks in "regional" studies, and the magnitude of risk greater than 10^{-4} to 10^{-6}. These are risk management issues and will be dealt with outside of the BHHRA.	Directed Change
General – 9	NA	Chemicals of Concern are defined in EPA policy and guidance according to the following definitions: 1. A subset of the COPCs that are identified in the RI/FS as needing to be addressed by the response action proposed in the ROD (Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents, July 1999). 2. The hazardous substances, pollutants, and contaminants that, at the end of the risk assessment, are found to be the risk drivers or those that may actually pose unacceptable human or ecological risks (Role of Background in the CERCLA Cleanup Program. April 2002). For the purpose of the Portland Harbor BHHRA, chemicals for which the estimated lifetime excess cancer risk is greater than 10-6, or the non-cancer Hazard Quotient is greater than 1 should be identified as posing potentially unacceptable risk at the Portland Harbor site. This list of chemicals should used to identify COCs in the draft FS. Consistent with EPA policy on risk, the risk assessment information must be clearly presented separate from any non-scientific risk management considerations.	Issue
General – 10	NA	EPA and the LWG agreed that while ingestion of human milk by	Revise

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		infants (previously referred to as breast feeding) would not be included in the draft BHHRA, it should be included in the revised BHHRA. The ODEQ is currently finalizing a revision to its Human Health Risk Assessment Guidance that incorporates the breast feeding exposure pathway. This guidance was developed in conjunction with Oregon Office of Environmental Health Public Heath, ATSDR, & EPA Region 10, and should be used as the basis for evaluation of the breast milk exposure pathway. This multi-agency collaboration compared two physiologically-based pharmacokinetic (PBPK) models for infant exposure to human milk (the Haddad model, an eight-compartment PBPK model that has been validated by comparing estimated milk concentrations against concentrations measured in a Canadian Inuit population, and the Yang model, a three-compartment PBPK model) to an EPA model which is a single-compartment, first-order kinetic model. This model and the parameters used for it are based upon numerous sources, including EPA's Methodology for Assessing Health Risks Associated with Multiple Pathways of Exposure to Combustor Emissions (MPE Guidance), Human Health Risk Assessment Protocol for Hazard Waste Combustion Facilities (Combustion Guidance), Exposure Factors Handbook, Child-Specific Exposure Factors Handbook, and examples from other hazardous waste sites. This comparison has shown that the EPA model is accurate and protective and should be used for the risk characterization for infant exposure to human milk in the Portland Harbor BHHRA. The risk characterization results from this pathway will primarily affect the non-cancer evaluations for PCBs for biota consumption and other pathways. Inclusion of the breast milk pathway will need to be reflected in the conceptual site model (CSM) for the site, and revisions to Figure 3.1 should note that infant exposure to mother's milk should be shown as a	

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		potentially complete pathway for all receptors.	
General – 11	NA	The draft BHHRA categorizes exposure pathways as complete, incomplete, or complete and significant. All pathways should be discussed, and justification should be provided for placing pathways into the various categories, including those pathways that were not assessed in the BHHRA. The risk assessment should provide a complete pathway analysis, which is a critical aspect of the process.	Clarify
General – 12	NA	In Section 7 of the BHHRA and elsewhere, results of analyses are reported without including the data used or the details of these calculations. As critical information is lacking, these analyses cannot be reviewed by EPA and, therefore, none can be accepted. Either the data and calculations must be included, or citations to appropriate sections of the RI that present the needed data and calculations must be provided.	Clarify
General – 12	NA	The overall exposure duration for recreational and tribal fishers and for recreational beach users has not been clearly defined in the risk assessment. It is reasonable to assume that fishers and recreational users consist largely of nearby residents, given that a 30 or 70 year exposure duration is used for the RME evaluations. Cancer risk is proportional to the duration of exposure, and behavioral and physiological characteristics of children increase their exposure relative to adults. Hence the cumulative cancer risk incurred is greater than would be the case assuming only a 6 year exposure duration as a child or assessing exposure to adults only. To avoid underestimating the overall cancer risks for these receptors, RME exposures should be evaluated as 6 years as a child, with the remaining period as an adult, which is consistent with EPA risk assessment guidance. Further, as discussed in the specific comments, when evaluating cPAHs, age-dependent adjustment factors to the cancer slope factor – 10 for exposures before 2 years of age; 3 for exposures between 2 and 16	Revise

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		years of age – need to be combined with age-specific exposure estimates. Separating the child and adult scenarios will result in a substantial underestimation of the increased risks associated with exposures occurring between the ages of 6 and 16 years of age	
1	Glossary	In the definition for the "upper confidence limit on the mean," remove the word "conservative."	Revise
2	ES.1	The first sentence should be replaced with the following sentence that uses language from EPA risk assessment guidance: *"The BHHRA is an analysis of potential adverse health effects (current or future) caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these releases.* ~~*to identify chemicals and exposure pathways that may result in potential unacceptable risks and to focus on those that are predicted to have the highest contribution to the estimated risk at the Portland Harbor Superfund Site (Site), consistent with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).*~~*"*	Revise
3	ES.1	Modify the first sentence in the first paragraph as follows: *"The general objective of the BHHRA is to assess potential risks to human health from exposure to <u>site-related</u> chemicals present in or entering into environmental media (i.e., water or sediment) or bioaccumulating in the food chain to help determine the need for remedial action, to provide a basis for determining concentrations of chemicals that can remain in place and still be protective of public health, and to provide the basis for comparing the effectiveness of various remedial alternatives."*	Revise
4	ES.1	1st Paragraph: Add the following sentence to the end of this paragraph: <u>"</u>*The BHHRA also includes an analysis of those chemicals in*	Revise

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		groundwater (GW) and surface water (SW) where concentrations are greater than ARARs (MCLs and AWQC) for these two media. These chemicals should be carried forward into the FS."	
5	ES.1	In the 2nd paragraph, delete the word "conservative" before "health protective," as it is frequently misunderstood and is redundant with "health protective." This should be done throughout the document where these words are used together.	Clarify
6	ES.1	In the 1st paragraph, modify the following sentence as indicated: "*The BHHRA dataset includes ~~only~~ those ~~matrices relevant~~ data used for direct human health exposure pathways that were quantitatively evaluated in the risk characterization sections of the document: surface sediment (0 to 30.5 centimeter (cm) in depth), surface water, groundwater, seep water, clam and crayfish tissue, and fish tissue.*"	Revise
7	ES.1 page 2,	1st paragraph – Delete the following sentence from the 1st paragraph: *"~~Transition zone water (TZW) data were used in loading calculations to estimate surface water concentrations that were compared with surface water screening levels, but were not included in the risk characterization because there are no complete direct exposure pathways for humans to TZW.~~"*	Revise
8	ES.1, page 3:	At the end of this section, on page 3 (after the last bullet), add the following: *"In addition to the risk characterization done in the BHHRA, an ARARs evaluation of SW and GW is presented in Section 6 of this document. This evaluation compares maximum detected SW and GW concentrations to EPA Maximum Contaminant Levels (MCLs), EPA Ambient Water Quality Criteria (AWQC) for the protection of human health from fish consumption, and EPA Regional Screening Levels (RSLs) for tap water."*	Revise

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9	ES.2, page 3:	Modify the 1st sentence as follows: *"The risk characterization in the BHHRA evaluated the following exposure scenarios, as provided in the approved Programmatic Work Plan and subsequent agreements with or directives from the EPA related to the BHHRA approach:"*	Revise
10	ES.2, page 3:	In the table at the bottom of this page, the following pathways should be added: *"-Consumption of surface water by domestic users* *-Infant consumption of human milk for all receptors* *-Beach user exposure to GW seeps"* (If the review of stormwater data does not add any exposure points for beach users, delete this scenario from the table but explain in a footnote why beach users are not being evaluated.)	Revise
11	ES.2, page 4:	These scenarios should be added to the 7 bullets on the top of page 4, so that there are 9 (or 10) contiguous bullets, and the following language should be deleted from the end of this section on page 4: *"~~Scenarios included in the BHHRA at the direction of EPA include:~~* *~~Exposure to untreated surface water as a domestic water source by a hypothetical future resident~~* *~~Clam tissue ingestion~~* *~~Exposure to in-water sediment and surface water by commercial divers~~"*	Revise
12	ES.2, page 4:	In the first paragraph after the first set of bullets, modify the following sentences as indicated: *"~~A hypothetical~~ Potential future use of surface water as a drinking water source by residents was also included as an exposure scenario.*	Directed Change

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		Even though ~~there are no known or anticipated future uses of the~~ surface water in the LWR within Portland Harbor is not currently used as a domestic water source, as discussed above under OAR 340-041-0340 Table 340A, domestic water supply is a designated beneficial use of the Willamette River, with adequate pretreatment…" This modification should be used throughout the HHRA when referring to future use of SW as a drinking water source. *"Asian clams (Corbicula sp.) are the only clam species that were found in the Study Area during sampling events and ~~they~~, in addition to crayfish, were evaluated for shellfish consumption in the BHHRA. Although harvest and possession of Asian clams is illegal in the State of Oregon, ~~and although~~ conversations with transients indicated that shellfish (both crayfish and clams) ~~may be~~ are eaten. by them." (~~during their limited time in an area (Wagner 2004), there is no documentation of ongoing shellfish consumption by humans occurring in the Study Area~~ In addition, crayfish are commercially harvested in the Willamette River, although the extent of this harvest within the PH Superfund site is not known."*	
13	ES.2, page 4:	The discussion here regarding the Exposure Assessment should be revised to provide additional details on exposure scenarios, receptors, and exposure assumptions, including spatial. A brief discussion of each scenario should be included with enough information to give the reader an understanding of the different exposure scenarios and receptors evaluated in the risk assessment. Recall that one objective of the HHRA is to provide useful information to the affected public.	Clarify
14	ES.2, page 4:	Delete the last sentence on this page as indicated: *"~~However, for some exposure scenarios, such as fish consumption, the exposure assumptions were based on upper-bound (i.e., 90th, 95th, and 99th) percentiles only, at the direction of EPA.~~"*	Directed Change

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		This sentence incorrectly characterizes fish consumption rates as all upper-bound estimates and implies that the fish consumption pathway is inconsistent with the RME/CTE approach used for other pathways. The upper percentiles used for fish consumption are based on the entire population, which includes non-fish consumers, and are used to represent smaller populations with higher exposure. As discussed in General Comment 1, they are not upper-bound levels for the various populations of fish consumers.	
15	ES.3, page 5:	1st full paragraph Delete the last portion of the last sentence shown here: "~~regardless of the feasibility or practicability of use of the actual areas.~~"	Revise
16	ES.3, page 5:	Delete the last sentence in the last paragraph in ES.3: *"~~Because many of the exposure scenarios that were evaluated in the BHHRA are highly variable and do not have standard default exposure factors, uncertainties associated with the exposure factors are anticipated to have significant impacts on the risk estimates.~~"* The phrase "highly variable" represents a subjective judgment, and will have different meanings to different readers of the assessment. The analysis of uncertainties should avoid unsupported claims about the relative variability of different exposure scenarios. An objective discussion of uncertainties for each scenario and their relationship to the quantitative risk estimates is adequate.	Revise
17	ES.3, page 5:	Delete the following 2 sentences from the end of the first paragraph: *"~~Uncertainty or variability factors, which typically range from two to three orders of magnitude (100 to 1,000 times), are often used by EPA in deriving toxicity values for human health given the uncertainties in~~*	Revise

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		~~*the toxicological data. As a result, actual risks within the Study Area could be lower than the potential risk estimates calculated in the BHHRA.*~~*"* "Uncertainty or variability factors" are not used for the derivation of cancer slope factors. Rather, their use is limited to the development of non-cancer toxicity criteria. In addition, the text fails to note uncertainties in toxicity factors that may result in underestimates of risk (e.g., lack of test data on reproductive, developmental and/or immunological endpoints).	
18	ES.5, page 6:	In the first paragraph replace "lifetime of exposure" with "lifetime." In most scenarios, the exposure duration is less than a lifetime.	Revise
19	ES.5, page 6:	This section provides insufficient information on the large amount of risk characterization results. The summary should be revised to include a clearer discussion of at-risk populations, the spatial distribution of risks for these receptors, and uncertainties important for interpreting these risks. The discussion should focus on exposure scenarios where risks are above 10^{-6}, 10^{-5} and 10^{-4}, and HIs are above 1. Figures E-2 and E-3 provide little useful information and should be replaced with figures and/or tables for those scenarios that present the risk and hazard estimates for each population evaluated. The primary focus of the information presented should be the specific receptor populations, such that the reader can clearly discern the overall risk and hazard estimate to each population, and the specific exposures and contaminants that represent the primary contributors to risk. LWG should provide examples of graphics they intend to include to EPA for review prior to developing and submitting a revised draft of the HHRA. The Executive Summary in particular should be readable and understandable by the general public.	Clarify

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20	ES.5, page 7:	Throughout the text, figures, tables and maps, the phrase "RME Exposure…" should be used in place of "95% Upper confidence limit (UCL) or Maximum."	Revise, clarify
21	ES.5, page 9:	In the 1st paragraph**,** revise the following sentence as shown: *"Possible effects of preparation and cooking methods, which can reduce concentrations of lipophilic chemicals in fish tissue, were not considered. ~~PCB concentrations have been shown to be reduced up to 87 percent (Wilson et al. 1998) with various cooking methods."~~*	Revise
22	ES.5, page 9:	Delete the following sentences as indicated: *"~~In estimating risks in this BHHRA, the conservative assumptions regarding fish consumption were multiplied together, which magnifies the conservatism in the risk estimates. The cumulative effects of the numerous conservative assumptions made during this BHHRA are risk estimates that are potentially significantly higher than actual risks that may exist within the Study Area.~~"*	Revise
23	ES.5, page 9:	Delete the last sentences at the end of the first and third paragraphs and the 4th bullet on Page 11: *~~"On a regional scale, fish consumption results in risk estimates exceeding cumulative risks of 10^{-4} or HIs of 1 based on fish tissue data collected from the Willamette and Columbia Rivers outside of the Study Area (EVS 2000, EPA 2002c)." and "In regional studies of fish tissue data from the Willamette and Columbia Rivers outside of the Study Area (EVS 2000, EPA 2002c) both PCBs and dioxins/furans also resulted in cancer risks greater than 10^{-4} and/or HQs greater than 1 for fish consumption using exposure assumptions similar to those in the BHHRA.~~"*	Revise

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24	ES.5, Page 9, 2nd Paragraph:	This paragraph includes a discussion of the fact that some chemicals were identified as posing potentially unacceptable risk because their concentrations were based on N-qualified data. These chemicals should be listed here, with a brief discussion of the impacts on risk when N-qualified data are deleted. A summary of this discussion should be added to the Uncertainty section.	Clarify
25	ES.5, Page 10:	The first paragraph on page 10 should be revised to describe the results of the ARAR evaluation of GW and SW.	Revise
26	ES.6, page 11:	The following changes should be made to this section: Actual risk estimates should be presented in place of vague statements such as "results in risks within or below the EPA target cancer risk range of 10^{-6} to 10^{-4} ." 1st bullet - Delete the last two sentences in the first bullet which eliminate shellfish consumption as a risk driver: ~~*"The evaluation of shellfish consumption was done at the direction of EPA, and there is no information documenting whether shellfish consumption actually occurs on an ongoing basis within the Study Area. Therefore, fish consumption is the exposure scenario that is considered the major risk for the Study Area".*~~ 2nd bullet - Revise the text to include consumption of shellfish as a substantial contributor to risk estimates. Include a list of the primary contributors to risk and the hazard identified for each pathway. 3rd bullet – Revise the text in this bullet as indicated: *"The body of information available regarding fish consumption rates, both nationally and regionally, indicate that the fish ingestion rates used in the BHHRA appropriately address a range of exposures that might occur for consumers of locally caught fish in Portland Harbor,*	Directed Change

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		including high fish consuming populations." Delete the last sentence: *"~~The fish tissue consumption risks in the BHHRA incorporate assumptions that may under-estimate, or more likely over-estimate the actual risks~~."* 4th bullet –Delete the 4th bullet: *"~~On a regional basis, risks from exposure to bioacummulative chemicals in tissue exceed EPA target risk levels. For example, the PCB concentrations detected in resident fish from the Willamette and Columbia Rivers are approximately 20 to 100 times higher than the EPA target fish tissue concentration, when adjusted for the ingestion rates used in this BHHA based on a target risk level of 1 x 10^{-6}~~."* 5th bullet – Add another bullet which summarizes the ARAR evaluations of groundwater and surface water performed in Section 6 and lists the chemicals that result from this evaluation.	
27	Section 1.0 Introduction, Page 12, 1st Paragraph:	Modify the first paragraph as follows: *"This Baseline Human Health Risk Assessment (BHHRA) presents an evaluation of risks to human health for the Portland Harbor Superfund Site (Site) in Portland, Oregon. The BHHRA ~~is intended to~~ also includes an ARAR evaluation for SW and GW in Section 6. Together, these evaluations ~~assessments. This BHHRA is intended to~~ provide an assessment of human health risks for the Site…"*	Revise
28	Section 1.0 Introduction, Page 12:	The document suggests that this report is somehow different from other risk assessments because EPA directed the use of conservative assumptions. In fact, risk assessments performed under guidance from other federal agencies, states, and even other countries, assess risks and inform risk management decisions based on assumptions that report	Revise

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		risks in the upper range of those possible. The risk assessment for PH is thus typical in this regard. Accordingly, with the exception of the first sentence, the text in the third paragraph should be deleted.	
29	Section 1.0 Introduction, Page 13:	Revise the bullet: *"Identify the chemicals and pathways that contribute the majority of the risk ~~COCs that will be the focus of risk management decisions for the Site.~~"* Add this bullet: *"Compare SW and GW data to EPA AWQC, non-zero MCLGs, MCLs, and RSLs to identify chemicals that exceed these ARARs which will be carried forward into the FS."*	
30	Section 1.2., page 14:	Modify the last paragraph in Section 1.2 as shown: *"The approach of this BHHRA is based on EPA (1989, 1991b, 2001a, 2004, 2005a) and Region 10 EPA (2000a) guidance.~~, except where further health protective assumptions were used at the request or direction of EPA.~~"* The risk assessment for PH follows EPA guidance and is not atypical or overly health protective for risk assessments done for a Superfund RI/FS.	Directed Change
31	Section 1.4, page 16:	Modify the 3rd bullet as follows: *"Section 6, Screening and ARAR Evaluation of Surface Water and Groundwater – This section presents an evaluation of surface water and groundwater data relative to ~~screening levels~~ EPA's MCLs, RSLs, and AWQC. ~~and the results of the risk characterization presented in Section 5.~~ This evaluation was conducted separately from the risk characterization, consistent with agreements with EPA."*	Revise

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		Modify the 5th bullet in Section 8, Summary, as follows: *"This section summarizes the findings of this BHHRA and identifies chemicals and pathways that contribute the majority of the risk ~~risk drivers; that is, those COCs with the highest contribution to estimated risks~~ within the Study Area."*	
32	Section 2.1, Available Data Page 17**:**	Modify this section as shown: *"The risk characterization BHHRA dataset includes only those matrices relevant for direct human health exposure pathways that were quantitatively evaluated: surface sediment (0 to 30.5 centimeter (cm) in depth), clam and crayfish tissue, fish tissue, surface water, and groundwater seeps~~. TZW data were used in loading calculations to estimate surface water concentrations that were compared with surface water screening levels, as presented in Section 6, but were not included in the risk characterization because there are no complete direct exposure pathways for humans to TZW.~~"* As described in Section 2.1, data from outside the study area were used to assess risk from in-water sediments and for surface water, while only data from within the study area were used for screening for chemicals of potential concern (COPCs). EPA did not concur with this process. Data collected from outside the study area should be screened for COPCs to determine if additional COPCs would have been selected for these two media. If additional COPCs are identified, they must be carried through the BHHRA. If additional COPCs are not identified, the screening results can be shown in Appendix F5 and summarized in the Uncertainty section.	Revise
33	Section 2.1.1, Beach Sediment, Map	Replace Map 2-1 with the Human Use Area figures (Figures 1a, b, and c) from the RI/FS work plan, Appendix C. These figures and Maps 5-1, 5-2, and 5-3 do a much better job of showing the length of the beaches selected, because the beach area is portrayed with a line along the	Clarify

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	2-1, Page 18	entire beach length, as opposed to a single point as shown in Map 2-1.	
34	Section 2.3, Chemical Screening Criteria, Page 23:	1st paragraph: The text in this section indicates that frequency of detection was not used in the COPC screening process. Use of frequency of detection is outdated, and the text fails to note that the screening process should not be used if "adequate computer capability" is available. The text referring to frequency of detection should be deleted.	Revise and clarify
35	Section 2.3.1, page 24:	Modify the last sentence of this paragraph as shown: *"As required by EPA Region 10 (see e-mail from Dana Davoli to Laura Kennedy, October 17, 2008, in Attachment F1), the geometric mid-point of the slope factor range from EPA 2001 (0.089 per mg/kg-day) was used for evaluating cancer risks for both inhalation and oral exposures. This value was also used to calculate an acceptable soil screening level of 7.7 mg/kg."*	Revise
36	Section 2.3.4, Hypothetical Future Exposure to Untreated Surface Water For Domestic Use, Page 26:	Replace "Hypothetical" with "Potential" in the title for this section. 1st paragraph- Add the following sentence: *"Even though no current or future uses of the LWR within Portland Harbor as a domestic water source have been identified, as discussed above under OAR 340-041-0340 Table 340A, domestic water supply is a designated beneficial use of the Willamette River, with adequate pretreatment. Because the Willamette River is potable and capable of serving as a potential drinking water source, the expectation is that this resource will be protected and remediated to achieve such use (40 CFR 00.430(a)(1)(ii)(F)) under CERCLA."*	Directed Change
37	Section 2.4, Identification of Chemicals of	Modify the 2nd paragraph as follows: *"Also, surface water and groundwater data were compared with EPA's MCLs, RSLs and /or AWQC to identify additional COPCs ~~additional~~*	Revise

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	Potential Concern, Page 26	~~*screening criteria but were not quantitatively evaluated in this BHHRA for the scenarios associated with the screening criteria, per an agreement with EPA. The screening evaluation*~~ *This comparison of surface water and groundwater is described in Section 6."*	
38	Section 2.4, Table 2-13	It is not clear why only one of the surface water samples (W020) from Swan Island Lagoon was used for COPC screening for transients and recreational beach exposures and for the domestic water source. Please add an explanation, or use all of the data in the COPC screen.	Clarify
39	Section 2.4.1.2, page 27:	Samples from outside the initial study area (RM 3-9) were not included in the COPC screen of in-water sediments. As discussed in the comments on Page 17, Section 2.1, Introductory Paragraph, a COPC screen should be done for data outside the ISA. If additional COPCs are identified, they must be carried through the BHHRA. If additional COPCs are not identified, the screening results can be shown in Appendix F5, Supporting Documentation for the Uncertainty and Variability Analysis, and summarized in the Uncertainty section.	Revise
40	Section 2.4.2, page 28: 1st Paragraph -	Modify the 3rd sentence in this paragraph: *"The potential for bioaccumulation is evaluated separately in this BHHRA as part of the fish and shellfish tissue assessments <u>and in Section 6, where SW data are compared to EPA's WQC for human health.</u>"* Also make this modification in the same sentence of the 1st paragraph on page 30. For recreational and transient scenarios, all of the samples of SW within the Shipyard should be included in the COPC screen and exposure point concentration (EPC) calculations.	Revise
41	Section 2.4.5,	Delete "Hypothetical" from the title and from the first and second	Directed Change

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	pages 29-30:	sentences on page 30, The word "hypothetical" should be deleted throughout the BHHRA when referring to SW for domestic use. Note that "future" implies by itself something that is "hypothetical," "potential," "possible," etc. 1st Paragraph - As stated in General Comment 5, under OAR 340-041-0340, Table 340A, domestic water supply is a designated beneficial use of the Willamette River, with adequate pretreatment, and the surface water is potable and capable of serving as a potential drinking water source. Therefore, the first paragraph in this section should be deleted. Uncertainties associated with future use of surface water can be included in the Uncertainty section. Section 2.4.5 should also include a brief discussion of the sources of surface water contaminants. Although EPA agreed that "integrated data" could be used to select COPCs and develop EPCs for surface water as a drinking water source, it was assumed that surface water data from throughout the Portland Harbor site that could be integrated (i.e., by combining near bottom and near surface samples in a given location) would be used and that these data would be integrated as appropriate. Instead only surface water data from the river transects, Willamette Cove, Cathedral Park and the Shipyard were used. Water could be withdrawn from the river at any point for use as drinking water. Therefore, the COPC screening for this pathway should be revised using all appropriate data sets, including data from Round 3. See additional comments on Section 3.4.3.4.	
42	Section 3.1, page 31:	This section of the risk assessment should provide a more complete pathway analysis, which is a critical aspect of the process. The document goes to some detail in defining different categories for exposure pathways (complete, incomplete, complete and significant, etc.), but subsequently discusses only those pathways quantified in the risk assessment. All pathways should be discussed and justification provided for placing pathways into the various categories (potentially	Revise, clarify

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		complete, incomplete, potentially complete but evaluated under a different receptor category, or potentially complete but not evaluated because exposure is expected to be insignificant). As noted in EPA's comments on the Round 2 Site Characterization Report, further discussion is required to explain why certain exposure pathways are evaluated and others are not. The rationale for evaluation/non-evaluation should be included. Pathways not evaluated should be addressed in the Uncertainty section.	
43	Section 3.1, page 31:	The difference between a "potentially exposed" and "hypothetically exposed" population is not clear. In the first sentence here and throughout the risk assessment, delete the term "hypothetical" when discussing potential exposure pathways.	Directed Change
44	Section 3.2, page 33:	In the bulleted list continued from page 32, replace "Hypothetical domestic water use" with "residents" or a similar term. "Domestic water use" is an exposure pathway, not a current or potentially exposed concentration. In addition, The CSM in Figure 3-1 should delete "Hypothetical" for residential ingestion of surface water. As previously indicated, future is a sufficient caveat.	Directed Change
45	Section 3.2.2, Figure 3-1 and Table 3-1:	Infant ingestion of mother's milk and ingestion and dermal contact with household uses of surface water should be added as potential exposure pathways to the bulleted list. The following changes should be made to the CSM in Figure 3-1: Infant exposure to mother's milk should be shown as potentially complete for all receptors. When human milk consumption is included in the final risk assessment, it will apply to all exposure pathways for bioaccumulating chemicals such as PCBs, dioxins/furans, and DDX. Therefore, the human milk pathway should not be limited to fishers, and all receptors in the CSM should be marked with the "potentially complete pathway" symbol. Also, the word "Breast-feeding" should be	Revise

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		changed to "Infant Consumption of Human Milk" in Figure 3.1 and in the text to be consistent with EPA's Child Specific Exposure Factors Handbook (September 2008). Note (d) in Figure 3.1, "Breastfeeding is not quantitatively evaluated in the BHHRA" should be removed.	
46	Section 3.3.1.2, page 35:	The document is internally inconsistent with regards to the discussion of transients. In this section, the document concludes that a given transient would only be exposed in a single area. Later in the document, evidence is presented that suggests transients move among areas frequently. The HHRA should include language that clarifies that the assessment of transients includes an evaluation of individual use areas not only because transient may inhabit single beach areas, but also because such an evaluation provides a range of possible risks for individuals that either move frequently or remain at a single location.	Clarify
47	Section 3.3.1.2, page 36:	The document indicates that maintenance dredging is "mechanical" and workers involved in dredging would not contact sediments. Dredge operators may seldom be exposed to sediments, but other workers involved with maintenance and cleaning of equipment, in off-loading sediments to disposal sites, and likely other activities have greater exposure potential. Either provide a more complete analysis, or omit this discussion.	Clarify
48	Section 3.3.3.4, page 38: Title -	Delete "Hypothetical" in the title for this section. The text in this section should be modified to be consistent with the comments in General Comment 5 and on Section 2.4.5, as follows: *"As mentioned in Section 2.4.5, no known current ~~or anticipated future~~ use of surface water within the Study Area for a domestic water supply is known or planned. However, ~~Due to a requirement by EPA, the hypothetical~~ <u>because domestic water use is a designated beneficial</u>*	Directed Change

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		use of the Willamette River, ~~a use of untreated~~ river water as a domestic water source was assessed as a ~~hypothetical~~ future pathway for both adult and child residents, resulting in exposures through ingestion and dermal contact. In this scenario, exposure to surface water could ~~hypothetically~~ potentially occur throughout the Study Area."	
49	3.3.5.1, page 39:	In the last sentence, delete the word "high-end" in the following sentence: *"Site-specific information is not available for fish consumption rates for specific species, so a range of ~~high-end~~ ingestion rates and various diets were evaluated in this BHHRA for both adult and child consumers."*	Directed Change
50	Section 3.3.5.2, Tribal Fishers, page 39:	In the second sentence, change the word "suggest" to "show" in the following sentence: *"The results of the survey show ~~suggest~~ that tribal members have higher fish ingestion rates than the general public."*	Revise
51	Section 3.3.6.1, page 40:	The language in this section should be deleted and replaced with the following text: *"Although the extent of shellfish consumption in the lower Willamette River is not known, information regarding the consumption of shellfish in the lower Willamette River is available. The Oregon Office of Environmental Public Health, Department of Health Services (DHS) had previously received information from ODFW indicating that an average of 4300 lbs of crayfish were commercially harvested from the portion of the Willamette River within Multnomah County each of the 5 years from 1997-2001. Most of this catch was sold to the Pacific Seafood Company of Oregon. DHS also has information from local commercial crayfish harvesters indicating that Europe is a major*	Revise

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		portion of their market. Furthermore, as part of the McCormick and Baxter assessment in 1991, Ken Kauffman at DHS talked with the wife of a licensed commercial crayfish harvester who served (at that time) as the secretary-treasurer of the Oregon Crayfish Association. She indicated that the area around McCormick and Baxter was a very productive Cray fishery and that she and her husband had harvested there prior to the advisory on many occasions. *"In addition to this historical commercial crayfish harvesting information in the Lower Willamette, DHS also occasionally receives calls from citizens interested in harvesting crayfish from local waters who are interested in fish advisory information. Between 2001 and 2007, DHS fielded 8 calls from citizens who reported catching and eating crayfish from Portland-area waters, although only one was specifically from the Study Are). It is not known what percent of individuals who catch and eat crayfish contact DHS to ask for fish advisory information. DHS estimates that for each person who contacts them regarding the safety of consuming crayfish from the Lower Willamette, there are many more that catch and consume the animals without contacting DHS* *"Although the collection of Corbicula is illegal, this is not particularly important for the pathway in general. There are indications that Corbicula are being collected and consumed (e.g., from the Linnton Community Center's discussion with transients). It is reasonable to assume that bivalve consumption is a current and possible future exposure pathway and that future biomass would increase."*	
52	Section 3.4, page 31:	In this section and subsequently throughout the risk assessment, replace the term "95% UCL/max EPC" with "RME EPC." The repeated references to a "mean" EPC relative to one based on a 95 percent UCL or maximum concentration is misleading. The text in the second paragraph incorrectly states that exposure point concentrations would	Clarify

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		be calculated differently for central tendency (CTE) and reasonable maximum (RME) exposures. Consistent with EPA guidance (1992, 2000), the EPC should represent an estimate of the arithmetic average concentration for a contaminant based on a set of site sampling data. Because of the uncertainty associated with estimating the true average concentration at a site, the 95 percent UCL of the arithmetic mean should be used for this variable. The 95 percent UCL provides reasonable confidence that the true site average will not be underestimated. The average concentration, defined as the 95 percent UCL, should be used for both CTE and RME evaluations. The RME evaluation should be distinguished from CTE by accounting for variability in such variables as exposure frequency and intake rates.	
53	Section 3.4.1.2, page 43:	The document indicates that some transients may be mobile, moving throughout the Study Area, while others may spend the majority of their time at only one beach area. This section represents a third interpretation of transient movement within the Study Area, which is probably the appropriate one. Information available indicates that some individuals move around, some don't, and patterns of movement are unknown. The appropriate interpretation of exposures and risks, calculated by beach area for transients, is that they represent a reasonable range of possibilities for transients residing in the Study Area.	Revise, clarify
54	Section 3.4.2, page 43:	EPCs were calculated for those chemicals (COPCs) selected by screening data within the Study Area. As discussed in the comments on Section 2.4.1.2, and Section 2.1, a COPC screen should be done for data outside the Study Area. If additional COPCs are identified, they must be carried through the BHHRA. If additional COPCs are not identified, the screening results can be shown in Appendix F5, Supporting Documentation for the Uncertainty and Variability	Revise

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		Analysis, and summarized in the Uncertainty section.	
55	Section 3.4.2.2, page 44:	The document indicates that repeated exposure to sediments over a lifetime would occur over a wide area. The text then implies that calculation of risks by half-mile segments misrepresents possible exposure and risks for fishers that use the beach areas. The assessment thus misses one of the main points of taking the approach of breaking risk calculations into short river sections. Use of beach areas by fishers may involve use of more than one river segment, but use cannot be predicted with available data. Thus, the current approach provides a range of possibilities for fishers that frequent one or a few beaches, but not all areas of the river. Such information may be important for risk management of the site. The approach also provides information for fishers who may want to take sediment contamination into account when making fishing location choices. These points should be included in the discussion in this section. Again recall the public information objective of the baseline assessment.	Revise
56	Section 3.4.3.4, page 48:	Delete "Hypothetical" in the title for this section.	Directed Change
57	Section 3.4.5, page 49:	Clarify that the mean EPCs for fish and shellfish tissue were calculated assuming that all NDs were one-half the detection limit.	Clarify
58	Section 3.5.1, page 51:	The last sentence, "The actual exposure at a given location may be less than that assumed … due to location-specific conditions," does not convey the appropriate interpretation of site-specific risk assessments. First, all such assessments seek to characterize risks in the upper range of those possible, and therefore intentionally estimate exposures that might be high for the bulk of the population. Second, the use of central tendency exposure parameters seeks to provide information that better characterizes typical population exposures. Location-specific	Revise, clarify

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		differences do influence "actual" exposures, but it's not clear whether such influences would either take the estimates outside of what is defined as RME, or would always tend to cause CTE to be overestimated. Noting uncertainties in risk assessment discussions is appropriate, but such discussions need to address issues objectively.	
59	Section 3.5.1.1, page 51	The first 3 sentences in the second paragraph of this section should be modified as follows: *"~~Although~~ Because it is unlikely that significant beach sediment exposure would occur for a dockside worker on a ~~regular~~ daily basis, exposure assumptions for the dockside worker were developed using EPA default exposure values for an industrial worker for most parameters except for exposure frequency. For exposure frequency, it was assumed that a worker would only contact sediment one day per week while working at the industrial site, rather than 5 days per week, which is the EPA default value."*	Revise
60	Section 3.5.1.2, pages 51-52:	The document asserts that significant contact with sediments is unlikely during mechanical dredging. However, the situation is complex. Potential for exposure depends on equipment used and varies among workers carrying out different tasks. In general, equipment operators for mechanical dredging are not affected since they operate from cabs or control areas away from the sediment. However, laborers working near the excavation equipment or near discharge points could be affected. Therefore, delete the first part of the following sentence as shown: *"~~Although most maintenance dredging activities are mechanical and are unlikely to result in significant sediment contact~~, [T]he in-water worker exposure factor intake rates for in-water sediment are the same as the dockside worker for beach sediment, which in turn are the same*	Revise

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		as default exposure factors for soil for an industrial worker." Modify the following sentence as shown: *"For intake rates <u>for transients</u>, EPA required that <u>the soil ingestion rate and soil adherence factor be increased above those EPA defaults</u> values ~~greater than those~~ recommended for residential soil exposures ~~be used~~ for beach sediment and that residential, tap water ingestion rates be used for surface water."* After this sentence add: *"The higher soil ingestion rate (200 mg/day instead of 100 mg//day) and soil adherence factor (0.3 mg/cm^2 instead of 0.07 mg/m^2) were used as it is expected that transients living on a beach would have more contact with beach sediment than a residential adult might have with residential soil and dust. For example, transients will have limited access to washing facilities and could therefore more frequently transfer sediments from hand to mouth while eating, smoking, etc."*	
61	Section 3.5.1.5, page 53:	This section should be titled "Non-Tribal Fishers" as none of the discussion pertains to tribal fishers. This would help distinguish Section 3.5.1.5 from Section 3.1.5.6, which is specific to tribal fishers.	Clarify
62	Section 3.5.1.5.1, page 53:	Please make the indicated revisions to the text in this section: *"~~EPA does not have recommended default exposure parameters for fishing scenarios., so the exposure frequency and duration for fishers are based on EPA's requirements or best professional judgment.~~ EPA provided the exposure frequencies and durations for the fishers used in this BHHRA. High-frequency fishers were assumed to fish from the same beach area three days per week for the entire year (156 days/year) for ~~the default residential exposure duration (~~30 years~~)~~ for the RME. Low-frequency fishers were assumed to fish from the same beach area for two days per week for the entire year (104 days/year)*	Revise

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		~~for the default residential exposure duration (~~30 years~~)~~ for the RME~~.~~ ~~Although it is not known how much sediment contact actually occurs during fishing activities, default intake values for residential soil were used."~~ An EF is appropriate for a resident at a single location (address), but does not suggest that 30 years is appropriate for living in a given city or town. Thirty years is used, not because it's a residential ED, but because we don't have a good way to estimate "time in the Portland area," and 30 years doesn't seem unreasonable. The estimate could underestimate exposure for some unknown fraction of lifetime Portland area residents, and this issue should be taken up briefly under uncertainties. Also, no support exists for this portion of the second sentence: "a fisher is unlikely to have significant contact within in-water sediment." Therefore, delete this sentence. Modify the 4th sentence as shown: *"Based on exposure scenarios for in-water sediment (i.e., contact with sediment on fishing lines, anchors and ropes, hooks, or crayfish pots and ropes), the extent of contact with in-water sediment is expected to be ~~would be significantly~~ less than what would occur with residential soil."*	
63	Section 3.5.1.5.1, pages 53-54:	Add "(Non-Tribal)" after "Consumption" in the title for this section. It is inappropriate to refer to the non-tribal adult and child fish ingestion rates used for this HHRA as "high," "higher," and "highest." These rates must be changed to "low," "medium," and "high," respectively, and references to the ingestion rates as "high end" deleted. The rationale for this comment is discussed in greater detail in General Comment 1. Other parts of the HHRA where fish consumption rates are discussed and/or presented should also be modified, including the tables. In fact, many of the tables still contain reference to "low,"	Directed Change

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		"medium," and "high" ingestion rates, which are the descriptors agreed to by EPA for the non-tribal fish ingestion rates in the HHRA. For example, in Table 3-29, which is referenced in this section, the three ingestion rates for non-tribal adults, 17.5 g/day, 73 g/day, and 142 g/day, are identified as low, medium and high ingestion values, respectively; the three ingestion rates for non-tribal children, 7 g/day, 31 g/day, and 60 g/day, are identified as low, medium and high ingestion values, respectively. In addition, the text at the end of the first paragraph referring to the fish consumption advisories at Portland Harbor should be deleted. The advisories represent an institutional control, and the baseline risk assessment should address exposures and risk in the absence of any actions to control or mitigate exposures. Fish ingestion rates for "consumers only" should be included when discussing the EPA 2002b document to make it clear that the 90th and 95th percentile rates for "consumers only" are higher than the values used here. The manner in which the values of 17.5 g/day and 142 g/day are presented makes them sound unreasonable when, in fact, they are quite reasonable when compared to the "consumer only" values of 200 g/day and 506 g/day, respectively. In particular, the rates used in the draft BHHRA imply that fish consumers would need to take only a fraction of total fish and shellfish from Portland Harbor. These fractions should be presented. At the end of the 1st paragraph in this section, it should be added that a goal of site remediation is to ultimately remove the fish advisory. Therefore, rates for potential future fish consumption should be considered in the absence of a fish advisory or after any advisory is modified to allow for greater fish consumption.	
64	Section 3.5.1.5.4, page	Table 3-29, which is referenced in the text in this section, lists the 3.3 g/day shellfish consumption value as a "low value." The text in this section should be modified to be consistent with the table and with	Directed Change

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	56:	previous agreements with EPA.	
65	Section 3.5.1.2, page 56:	Delete the second sentence, as it represents an unsupported assumption. Replace the first three sentences in the second paragraph with the following sentence: *"Contact with sediment on anchors or hooks represents the most likely exposure route for contact with in-water sediments for tribal fishers."*	Revise
66	Section 3.5.1.3, page 57:	Add "Tribal" in front of "Fish" in the title for this section. ODEQ is proceeding to develop state water quality standards based on the CRITFC Fish Consumption Survey result of 175 g/day. This should be discussed in this section as support for the selection of 175 g/day as an appropriate fish consumption rate for tribal populations who regularly consume fish.	Revise, clarify
67	Section 3.5.1.6.3, page 58:	Modify the following sentence as shown: *"The combined intakes from anadromous salmonids <u>and</u> lamprey, <u>from</u> sturgeon, and <u>from</u> the remaining fish species in the above table were used to estimate risks from fish consumption."*	Revise
68	Section 3.5.1.8, page 59:	Title - Replace "Hypothetical" with "Potential" in the title for this section. Change the word "hypothetical" to "potential" when referring to domestic water in this section and throughout the HHRA. Inhalation of contaminants from surface water should be included as a part of the scenario, unless it can be shown that this is not an issue for the surface water contaminants that are selected for evaluation in Section 6.	Directed Change
69	Section 4.1,	In the first sentence, the word "dose" should be added before	Revise, clarify

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	page 62:	"response" so that it reads, "dose-response potency." "Inhalation SFs" should be changed to "Inhalation Unit Risk Values." "Inhalation RfDs" should be changed to "Inhalation Reference Concentrations."	
70	Table 4-2, Non-Cancer Toxicity Data	It is not clear where acronym "I" (RfDs for intermediate exposure duration) applies since the same letter "I" is also an acronym for IRIS.	Revise, clarify
71	Section 4.3, page 63:	Revise the text as shown: *"The California Environmental Protection Agency (Cal EPA 2008.) ~~includes SFs that have been peer-reviewed.~~"* The Cal EPA database includes additional peer-reviewed values, such as acute and chronic reference exposure levels.	Revise
72	Section 4.6, page 67:	In the 3rd bullet**,** the following sentence should be modified as shown: *"This approach <u>may</u> double-count <u>a portion of</u> the toxicity of the dioxin-like PCBs, as discussed in Section 7.3.6."*	Revise
73	Section 4.7, page 68:	It would be useful to provide more information on the COPCs for which the oral toxicity factor was modified. For example, from a review of Tables 4-1 and 4-2, it appears that this adjustment was not made for any slope factors, and was limited to the metals for RfDs. The approach used to evaluate dermal risk could underestimate risk by a factor of up to 2, since no adjustment to slope factors or RfD is required if oral absorption efficiency is greater than 50 percent.. This issue should be discussed as an uncertainty in Section 7.	Clarify
74	Section 5.1.2,	The following statement occurs in this section:	Revise

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	page 70:	"*All cancer risks were calculated using this same linear model, even though risk estimates for some scenarios exceed 10^{-2}, in which case, EPA guidance (EPA 1989) states that risks may be calculated using an exponential model.*" This text is incorrect, as the referenced guidance clearly states that the linear equation is valid only when estimated risks are less than 0.01. The exponential one-hit equation for high carcinogenic risk levels should (not "may") be used where estimated risks are greater than 0.01. At least one calculation for bass and one for carp (e.g., Total PCBs (adjusted) for WB bass, RM 11, and for WB carp from RM 4-8, both at 142 g/day) should be re-calculated using the exponential model. The last two sentences in this section should be modified as follows: *"Estimated total cancer risks were compared to 10^{-4}, 10^{-5}, and 10^{-6} cancer risk targets based upon the following language in EPA's National Contingency Plan (NCP):* "For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6} "target range. *The 10^{-6} risk level shall be used as the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at a site or multiple pathways of exposure."* When discussing risk characterization results in the HHRA, risk values should be compared to cancer risk values of 10^{-6}, 10^{-5} and 10^{-4}.	
75	Section 5.2, page 71:	The presentation of information in this and the following subsections should be consistent with EPA's Risk Characterization Policy (http://www.epa.gov/osa/spc/pdfs/rchandbk.pdf) to assist with preparation of a transparent and useful characterization of risk results. Accordingly, several global changes should be made to these	Directed Change

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		subsections: a) As previously discussed, the HI calculated by summing the HQs for individual chemicals should be added to all of the risk characterization tables in the HHRA. For example, in Table 5-138, the results for WB carp, RM 0 to 4, should have the HIs shown for each ingestion rate under non-cancer. This approach is used for cancer risk calculations in this and all other tables, but not for the non-cancer HIs. Only those exposure points where the HI is greater than 1 should be further evaluated in tables that show the endpoint-specific HIs. b) The HHRA (including numerous instances throughout this section) makes inappropriate statements regarding compounding uncertainties. While EPA and the LWG agreed to limit the discussion of uncertainties to either the end of each section (e.g., Exposure Assessment, Toxicity, Risk Characterization) in the HHRA or in the Uncertainty Section, statements on uncertainty are included throughout the discussion in this and other sections of the draft BHHRA. These statements that "risks could be higher or lower if" provide no useful information, or the text focuses only on those uncertainties that will result in an "overestimate" of risk. These sections must be revised to eliminate inappropriate statements on compounding uncertainties. Statements regarding uncertainties must be moved to the end of major sections or to the uncertainty section. The latter is the most appropriate place for more detailed discussion, such as those involving fish ingestion rates. The text repeatedly states that, "multiple conservative assumptions compound to result in an estimate of risk that can be many times (or orders of magnitude) greater than the likely actual risk posed by a particular site." EPA is not aware of any studies that support the generalization that deterministic risk assessments typically result in estimates of risk that are "orders of magnitude"	

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		greater than any that are likely to occur. The primary concern should not be related to the compounding of conservative inputs, but should focus on the choice of the inputs themselves. If values are chosen that fall outside the range of those possible, and are associated with a sensitive input to the exposure and risk calculations, then estimated risks can fall outside the upper end of those possible. However for the BHHRA, the inputs were carefully chosen to be representative of either current and/or potential future scenarios and to result in an estimation of Reasonable Maximum Exposure, as required by EPA Superfund guidance. The approach used in this HHRA follows standard EPA risk assessment guidance and is similar to risk assessment approaches used on other Superfund sites. There is no reason to conclude that the risk assessment for Portland Harbor should be considered exceptional with regard to reasonable maximum exposure assumptions. c) A summary discussion that is linked to one or more summary tables and graphs/maps should be presented at the end of each scenario to summarize the information that is provided in the many tables in this HHRA. For example, at the end of this Section 5.2.1, Beach Sediment Characterization Results, a summary table should be added that includes those beaches with cancer risks exceeding of 10^{-6}, 10^{-5}, and 10^{-4} for each receptor, with the actual cancer risk value for each beach by receptor and contaminant for that beach. The summary discussion should link to this table, to a discussion of Map 2-1, and to the graphs described below for this section and other sections. For some scenarios, like biota consumption, more than one summary table/graph may be needed. d) Graphical depictions of risk should be added to this section for each scenario to provide spatial information on those receptors	

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		and pathways with the highest risks: tribal and non-tribal fish consumption for adults and children, consumption of shellfish, in-water sediment exposure for fishers, wet suit diver, and exposure to beach sediment. These depictions should spatially show the risk characterization results for total cancer risks, and for cancer risks and non-cancer HIs for selected chemicals posing potentially unacceptable risk by exposure area. These figures should be tied into the discussion of the summary tables mentioned above in (b). LWG should allow for EPA review of graphics prior to completion of the revised draft. e) When discussing the risk from cPAHs, the sum of the risks from all cPAHs should be included as the primary risk results. These results should include a presentation of relative contributions of different cPAH species. cPAHs typically occur as a mixture, and individuals will most likely be exposed to all cPAHs present.	
76	Section 5.2.1, Pages 71-76:	A summary discussion should be presented at the end of this section that references a summary table showing all of the beaches that are above risk levels of 10^{-6}, 10^{-5}, and 10^{-4} for each receptor, with contaminants included. This presentation should also include graphs for tribal adult exposure to beach sediments, for total cancer risk by beach, and for cancer risk for arsenic, dioxin/furan TEQ, B(a)P, and total cPAH by beach. Other beach scenarios (e.g., recreational users, transients, and dockside workers) should also be shown. The graph should be organized by river mile (east and west) with corresponding sample numbers for each river mile shown. a) The total HI calculated by summing the HQs for individual chemicals should be added to all of the risk characterization tables. Tables showing endpoint-specific HIs can be eliminated for those scenarios where the total HIs for all chemicals are less than 1.0, but should be shown for endpoints with HIs that exceed 1, if more than	Revise, clarify

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		one endpoint shows such a result. b) Maps 5-1, 5-2, and 5-3 should include the calculated risk values for those beaches where estimated risks are greater than 1×10^{-6}. c) The discussions of arsenic are vague throughout this section and elsewhere in the risk characterization section. The discussions provided do not allow the reader to evaluate arsenic contribution to risks or at which beaches arsenic concentrations are greater than background levels. The points that need to be made are 1) arsenic occurs both naturally and as a result of environmental releases, and 2) assuming an estimated background of 7 mg/kg, the degree to which background concentration contribute to the EPC and risk should be described.	
77	Section 5.2.1.3.1, pages 72-73:	As previously noted, when referring to exposure areas that are above a defined risk, the actual risk value for the exposure area should be presented. For example, where risks associated with cPAHs are greater than 10^{-6} such as at beaches 04B024 and B003, , the specific risks should be presented.	Clarify
78	Section 5.2.2, pages 76-81:	A summary discussion should be presented at the end of this section that includes reference to two summary tables by RM for each side of the river. These tables should be included for those in-water sediment areas with estimated risks greater than 10^{-6}, 10^{-5}, and 10^{-4} for each receptor. Chemicals posing potentially unacceptable risk for each area and receptor should be included. Graphical depictions should be presenting showing cancer risk and non-cancer hazards associated with tribal adult fishers exposure to in-water sediment by one-half river mile segments for total cPAHs and dioxin/furan TEQs. Results for other fisher scenarios should also be presented in the figure. A similar graphical depiction of total cancer risk for commercial divers in wet suits by one-half mile segments for total cPAHs, B(a)P, dioxin/furan	Clarify

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		TEQ, PCB TEQ, and total TEQ. Results for the diver in a dry suit and for in-water workers should also be shown on the figures.	
79	Section 5.2.2, pages 76-81:	HIs calculated by summing HQs for individual chemicals should be added to all of the risk characterization tables. Tables showing endpoint-specific HIs can be eliminated for those exposure areas/scenarios where the total HI for all chemicals is less than 1.	Revise, clarify
80	Section 5.2.2, pages 76-81:	When referring to cancer risks from a chemical or class of chemicals in the narrative, that risk value should be provided. For example, in the second sentence on page 79, the risk from dioxins/furans, B(a)P, and total cPAHs should be clearly presented.	Clarify
81	Section 5.2.2, page 76:	Delete the following sentence, as it mischaracterizes the effect of multiplying exposure parameters: *"The health protective assumptions regarding direct exposure to in-water sediment were multiplied together, which magnifies the overall conservatism in the risk estimates."*	Revise
82	Sections 5.2.2.3.1 and Section 5.2.2.3.2, pages 79-80:	The last paragraphs in these 2 sections contain much of the same text provided in Section 5.2.2.3. The repetitive text in these two paragraphs can be deleted.	Revise
83	Section 5.2.3, page 81:	Delete the following sentence from the first paragraph, as it mischaracterizes the effect of multiplying exposure parameters**:** ***"****The health protective assumptions regarding direct exposure to surface water were multiplied together, which magnifies the overall conservatism in the risk estimates."*	Directed Change

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84	Section 5.2.3, pages 81-85:	HIs calculated by summing HQs for individual chemicals should be added to all risk characterization tables. Tables showing endpoint-specific HIs can be eliminated for those scenarios where the total HI for all chemicals is less than 1. A summary table showing river segments with SW contaminant concentrations above a cancer risk of 10^{-6} and 10^{-5} for each segment should be added at the end of this table. If the results of the screening assessment of potential future domestic water use using all of the relevant SW data identifies chemicals above screening levels in addition to arsenic, the results should be presented on a figure.	Clarify
85	Section 5.2.3.4, page 83:	Replace "Hypothetical" with "Potential" in the title for this section and elsewhere within Section 5.2.3. As previously discussed, additional surface water sampling data should be used for the screening for selection of COPCs, using both MCLs and EPA RSLs.	Directed Change
86	Section 5.2.3.4.1, page 84:	The text describing arsenic concentrations in surface water is difficult to decipher and, as presented, appears to imply that concentrations of arsenic in surface water in the Study Area are less than background, which does not appear to be the case. The discussion in this section should clearly note the degree to which arsenic is detected in surface water at concentrations greater than background and the contribution of naturally-occurring concentrations to the total risk estimates. The text should note the current MCL for arsenic as a benchmark to help putting the risk estimates in perspective.	Clarify
87	Section 5.2.4.1, page 85:	In the first paragraph, delete the third sentence, as it mischaracterizes the effect of multiplying exposure parameters: *"The health protective assumptions regarding direct exposure to groundwater seeps were multiplied together, which magnifies the overall conservatism in the risk estimates,"*	Revise

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88	Section 5.2.4.1, page 85:	HIs calculated by summing HQs for individual chemicals should be added to all of the risk characterization tables. Tables showing endpoint-specific HIs can be eliminated for those scenarios where the total HI for all chemicals is less than 1.0	
89	Section 5.2.5, page 86:	Delete the following from the first paragraph of Section 5.2.5: *"In estimating the risks in this BHHRA, the health protective assumptions regarding fish consumption were multiplied together, which magnifies the overall conservatism in the risk estimates. The cumulative effects of the numerous conservative assumptions made during this BHHRA are risk estimates that are potentially significantly higher than actual risks that may exist within the Study Area."*	Revise
90	Section 5.2.5, pages 86-91:	Delete the last paragraphs in Sections 5.2.5.1.1, 5.2.5.1.2, 5.2.5.2.2 and 5.2.5.3.2. Exposure assumptions summarized in these paragraphs have already been presented in an earlier section, and the uncertainties are repeated at the end of each subsection so as to suggest that the risk characterization results are extremely uncertain. Hence, the last paragraph in each of these sections should be moved to the uncertainty discussion. Wherever present, revise the following sentence as indicated: *"The calculated risks do not account for any ~~decrease~~ changes in tissue concentrations of chemicals that may occur during preparation or cooking of the fish."*	Revise
91	Section 5.2.5, pages 86-91:	When discussing fish consumption in the Uncertainty Section, revise the text as indicated: *"Fish consumption was assumed to occur at this level every day of every year for 70 years (or 30 years)."* Fish ingestion rates are annually amortized based on the estimated number of fish meals per month and typical serving sizes. This rate	Revise

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		does not imply that fish is ingested every day. In fact, all ingestion for a given rate could in theory occur over a few to several months, with no fish consumption for the rest of the year. In addition, such patterns could change over the course of 30 years, and greater fish consumption could occur in some years and less in others. The assumption is that over the course of 30 years, individual fish ingestion rates don't change substantively. This comment also applies to the discussion regarding consumption of shellfish on page 91.	
92	Section 5.2.5, pages 86-91;	A summary discussion that is linked to one or more summary tables and graphs/maps should be presented at the end of the section for tribal fishers and at the end of the section for non-tribal fishers. This section should include figures for each non-tribal scenario to provide spatial information for total cancer risks as well as contaminant specific risks and HIs by river mile. These figures should be tied into the discussion of the summary tables and should include the following information: a) Total cancer risks for adult (non-tribal) fish consumption of bass by river mile. The range in risks from the 3 consumption rates should be shown. b) Cancer risk for adult (non-tribal) fish consumption of bass by river mile for total PCBs (adjusted), total DDD, and total TEQ. The range in risks from the 3 consumption rates should be shown. Alternately, the highest ingestion rate of 142 g/day can be used alone. c) Endpoint-specific non-cancer HQs for child (non-tribal) fish consumption of bass by river mile for total PCBs (adjusted), total DDD, and total TEQ. The range in HQs from the 3 consumption rates should be shown. Alternately, the highest ingestion rate of 142 g/day can be used alone. d) Graphs similar to those described above for tribal fishers. Since	Revise, clarify

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		river mile calculations were not done for tribal fishers, it might be possible to include tribal fishers on the non-tribal fisher graphs. e) Graphs similar to those described above for carp. Results for river miles 3-6, 6-9, 0-4, 4-8, and 8-12 can be shown on one graph. For cancer and non-cancer HIs, cancer risk and HIs for total PCBs (adjusted), total DDD, and total TEQ should be shown in separate graphs by river mile segments. A legend with the figure should explain total PCBs and the three TEQ estimates. The HI calculated by summing the HQs for individual chemicals should be added to all of the risk characterization tables. A legend with the figure should explain total PCBs and the three TEQ estimates.	
93	Maps 5-7 through 5-14:	Maps 5-7 through 5-14 should be relabeled and should present additional information. Fish ingestion rates for 17.5 g/day should be labeled as "Low," not "High"; the shellfish consumption rate of 3.3 g/day should be labeled as "low"; etc. In addition, maps with every segment of the river highlighted are not useful. For bass, cancer risks and HIs for each river mile need to be added to the map. For the carp, crappie and bullhead data from Round 1, the cancer risks and HIs need to be added for each sampling segment for which an EPC was calculated.	Directed Change
94	Section 5.2.5.1, pages 88-90:	As discussed in General Comment 1, the descriptors for fish consumption rates need to be changed from high, higher, and highest to low, medium, and high, respectively.	Directed Change
95	Section 5.2.5.3, pages 90-91:	Delete this section as it contains inappropriate comparisons to regional risk levels. As discussed in General Comment 5, several inappropriate discussions are included that relate to background and "regional" risk levels in this section and other sections of the draft BHHRA, especially for biota. EPA and the LWG agreed that the biota data collected upstream of the	Revise

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		Portland Harbor site by the LWG could be presented in the RI for "informational purposes," but should not be used for a background assessment in the BHHRA. Therefore, no "background" data set exists for biota for Portland Harbor that can be used and/or evaluated in the BHHRA. Any reference to background in relation to biota in the BHHRA should be deleted. EPA acknowledges our agreement to use upstream tissue data for information purposes in the remedial investigation report. Comparisons are also made to risks from biota consumption in other "regional" risk studies (e.g., the EPA *Columbia River Basin Fish Contaminant Survey*, and the ODEQ mid-Willamette Basin study). These studies, which were initiated because of known or suspected concerns with contamination in the particular areas in which they were done, are not relevant to the Portland Harbor site. EPA's risk assessment guidance is clear that risks from all contaminants at the site are to be characterized. Following the risk characterization, comparisons to background risk can be discussed in a risk assessment, provided such data are available. However, this is not the case for biota in Portland Harbor. Comparisons to risks from other contaminant surveys are irrelevant and have no place in the BHHRA as they provide no useful information on the Portland Harbor Site risks or background risks. Contribution of background to the overall site risks can be addressed using background sediment data, which were collected specifically for use in the risk assessment.	
96	Section 5.2.6, pages 91-92:	As noted in the specific comments on Section 5.2.5, the following revisions should be made in this section: a) Delete the following sentence in the first paragraph: ~~"*In estimating the risks in this BHHRA, the health protective assumptions regarding shellfish consumption were multiplied together, which magnifies the overall conservatism in the risk*~~	Directed Change

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		~~*estimates. The cumulative effects of the numerous conservative assumptions made during this BHHRA are risk estimates that are potentially significantly higher than actual risks that may exist within the Study Area.*"~~ b) Uncertainties should be discussed in Section 7, Uncertainty Analysis. Move the last paragraph in this section to the uncertainty section Modify the following sentence: "*The shellfish consumption scenario assumes the same ingestion rate every day of every year for 30 years."* to note that, as stated in the comments above on fish consumption, shellfish consumption rates are annually amortized based on the estimated number of shellfish meals per month and typical serving sizes. This rate does not imply that the same amount of fish is consumed every day. When consumption of shellfish is discussed in the Uncertainty Section, the following phrase should be deleted: "*despite the fact that there is no documented ongoing consumption of shellfish in the Study Area and the harvest or possession of Asian clams, the species assessed in the BHHRA, is illegal*."	
97	Section 5.2.6, pages 91-92:	The discussion in this section should be linked to a summary table that shows cancer risks by river mile on each side of the river for clams and by sample point for crayfish. Sample numbers should be included. Figures or graphs should be included that depict the total cancer risk results due to ingestion of clams (based on undepurated samples) for each river mile on each side of the river, cancer risks for total PCBs (adjusted), total carcinogenic PAHs (not just benzo(a)pyrene), total dioxin/furan TEQs, total PCB TEQs, and total TEQ by river mile segment. For non-cancer HIs, total PCBs (adjusted), total dioxin/furan TEQ, total PCB TEQ, and total TEQ should be shown in separate figures by river mile segment. Similar figures should be included showing risks and hazard associated	Revise, clarify

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		with consumption of crayfish. Results at each sampling point on each side of the river (east and west) should be shown on one graph, and the river mile included with the sample point number. Multiple sample points will be mapped for some river miles. Graphs should be provided for total cancer risks for each river mile on each side of the river. For cancer, total PCBs (adjusted), total Aroclors, and total TEQ should be shown in separate figures by river mile segment. Non-cancer HIs for total PCBs (adjusted), total Aroclors, and total TEQ should be shown in separate graphs by river mile segment.	
98	Section 5.2.6, pages 91-92:	The consumption rate of 3.3 g/day should be referred to as "low" not "medium." The use of the word "low" for 3.3 g/day was agreed to by EPA and the LWG and was used in the Round 2 Report. A discussion which describes the number of meals per month to which consumption rates of clam or crayfish equate should be included here. For example, for clams, 3.3 g/day is less than one 8-ounce meal every 2 months, and 18 g/day is approximately two an one-half 8-ounce meals/per month.	Directed Change
99	Section 5.2.6, pages 91-92:	The document concludes that Study Area-wide cancer risks from consumption of undepurated clams are 2 to 3 times higher than those from Study Area-wide cancer risks from depurated clams, and that corresponding non-cancer hazards are 1 to 2 times higher. The database for COPCs in depurated clam tissue is limited to 5 of the 22 clam samples, and these 5 samples are from the northern stretch of the river (1E and 2W) and the southern stretch of the river (10W, 11E, and 12E). It is not appropriate to compare risks from these 5 depurated samples from the edges of the site to the 22 non-depurated clam samples from the entire length of the site from RM 1 to RM 12, or to compare non-depurated clams to depurated clams from only the edges of the site (1E and 2W; 10W, 11E, and 12E) and assume that the results are representative of the entire site. As no supporting calculations are presented in the draft BHHRA, it is not clear what samples were used for these calculations, and EPA cannot determine if the calculations are	Issue

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		correct. These supporting calculations should be included in Attachment F5. In drawing conclusions from this analysis, the discussion should be clear that these data only provide information on 5 sampling locations, all of which are on the edges of the site rather than in areas with particularly high cPAH concentrations.	
100	Section 5.2.6, pages 91-92:	Additional clarification is needed for some of the assumptions used in both the ALM and the IEUBK. It appears that the values for exposure frequency to in-water sediments should be the same as those presented as central tendency for exposure frequency for each respective receptor in Table 3-27 unless additional rationale for the values cited in Tables F4-1 and F4-2 can be provided. In addition, the basis for the site-specific values for the adult baseline blood-lead level and absolute GI absorption should be more clearly explained. To the extent possible, the default values in the IEUBK for soil lead concentration, house dust lead concentration, lead concentration in air and in drinking water should be replaced with site-specific values.	Clarify
101	Section 5.3, pages 96-97:	As discussed previously, the descriptions of "high," "higher," and "highest" for the three non-tribal fish consumption rates should to be changed to "low," "medium," and "high," respectively.	Directed Change
102	Section 5.3, pages 96-97:	Delete the last two sentences in the first paragraph.	Directed Change
103	Section 5.3, pages 96-97:	Modify the last paragraph in this section as follows: "Chemicals *were identified as preliminary COCs if they resulted in a cancer risk greater than 1 x 10^{-6} or an HQ greater than 1 under any of the exposure scenarios for any of the exposure point concentrations evaluated in this BHHRA~~, regardless of the uncertainties~~. Preliminary COCs and the associated exposure scenarios are presented in Table 5-187. ~~The final COCs, which are based on consideration of the uncertainties in this BHHRA, are presented in Section 8. Certain chemicals and media contribute significantly more than others to~~*	Revise

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		~~*overall risk for the Study Area. A more detailed description of risk drivers for the Study Area is provided in Section 8.*~~"	
104	Section 5.3, pages 96-97:	The summary of the ranges of variation in HI values is overstated here and in Table 5-186, as indicated previously in the general comments. This exaggeration occurs because each toxic endpoint in an exposure scenario is considered independently. Instead, each scenario should be evaluated based on the chemical(s)/endpoint combination resulting in the greatest HI. For example, in Table 5-186, the HI range for tribal fisher direct exposure to in-water sediment across all half-mile segments is listed as 0.00000008 to 1. This range is developed using the very lowest chemical/endpoint combination (naphthalene causing whole body effects) to the highest chemical/endpoint combination (arsenic causing skin effects). The lowest HI for a scenario is irrelevant for decision making; decisions are based on the highest calculated HI at each location. Using the approach presented in the BHHRA, one would show dramatic ranges in HI for every scenario in every risk assessment. The correct range for tribal fisher sediment exposure should be developed using the highest chemical/endpoint combination at each location (Table 5-36). This range is 0.002 (arsenic, skin effects) to 1 (dioxin TEQ, reproductive effects). In this example, the HI range in Table 5-186 is overstated by a factor of 25,000. The values in the bullets and in Table 5-186 will also change because many of the endpoint-specific tables will have been removed because the total HIs for many scenarios are less than 1.	Revise
105	Section 6.0, Page 98:	The title of this section should be changed to *Screening and ARAR Evaluation of Surface Water and Groundwater*. This evaluation should utilize the maximum detected concentration of each chemical in individual SW samples included in the RI, including near bottom samples, samples collected during various source evaluations at Portland Harbor, and pore water samples collected in the biologically active zone (0 to 40 cm). These results should be compared to EPA	Directed Change

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		AWQC (at fish consumption rates of 17.5 and 142 g/day), non-zero MCLGs, MCLs, and RSLs. Any chemical for which the maximum detected concentration is greater than its AWQC (at both ingestion rates), non-zero MCLG, or MCL should be included in Table 8-1 and carried forward into the FS. The limitations of this screening process should be discussed in the uncertainty section of the risk assessment. The revised Section 6 should include a table or series of tables that present the various screening values and which values are exceeded for each chemical. Sampling locations where specific screening criteria are exceeded should be documented in a table and presented on a map or series of maps similar to Map 6-1 that is currently in the draft BHHRA. The labeling of sample locations on the tables and maps should presented such that the maps and tables can be used together to identify chemicals that exceed criteria.	
106	Section 7.0, page 104:	Revise the first paragraph to delete the following sentence: *In a deterministic risk assessment multiple conservative assumptions compound to result in an estimate of risk that can be many times (or orders of magnitude) greater than the likely actual risk posed by a particular site."* There is no information presented in this section or anywhere else in the risk assessment to support such a claim.	Revise
107	Section 7.0, page 104:	EPA disagrees with the characterization presented in the second paragraph that only a probabilistic risk assessment (PRA) can provide a quantitative estimate of uncertainty. At a minimum, a quantitative assessment of the uncertainty associated with each numerical value used in the risk assessment is possible. The text in this section fails to note that default and/or "upper-bound" values were used in the risk assessment only when reliable alternative values are not available, and were used to ensure that any bias introduced into the risk assessment	Issue

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		did not result in an underestimate of actual site risks. Further, this section fails to note that the reliability of any numerical probabilistic assessment of uncertainty is dependent on a reliable knowledge of the distribution of plausible values for each of the variables used in the assessment, and that the guidance cited specifically states that a tiered approach to a PRA is advocated, which begins with a point estimate risk assessment. Important considerations include the time required to perform the PRA, the additional resources involved in developing the PRA, the quality and extent of data on exposure that will be used in the assessment, and the value added by conducting the PRA. Unless specific information can be provided here regarding how a PRA would enhance the decision-making process for Portland Harbor, this paragraph should be deleted.	
108	Section 7.0, page 105:	Last paragraph of this section: Delete the 2nd sentence, which begins: "*The objective of the uncertainty analysis is to understand the overall degree of conservatism...*" While conservatism is one important aspect of the uncertainty analysis, the analysis also informs the risk managers of gaps in knowledge, unsupported assumptions and extrapolations, data gaps and other data issues, and other sources of uncertainty that may affect risk estimates and subsequent risk management for the site. This language implies that the results of the HHRA are always overly conservative, when in actuality the results may under-predict risks in some instances. The objective of the uncertainty analysis should be a balanced discussion of the assumptions on which the risk estimates are based.	Directed Change
109	Section 7.1.1, page 105:	The assertion in the text that, "*target species were selected to provide the most conservative estimate of risk,*" is unjustified. The fish species for the HHRA evaluation were selected to be representative and reasonably conservative and to consider the factors given in the last sentence of this paragraph, "*Factors in selecting the target species included: consumption by humans, home range, potential for*	Directed Change

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		bioaccumulation, trophic level of species, and abundance." EPA, its partners, and the LWG agreed to the species selected. It is certainly not clear that all species not included in the quantitative analysis would be "less conservative." Therefore, the following sentence should be deleted: "*The target species were selected to provide the most conservative estimate of risk to human health and are a source of uncertainty when used to represent the risk from consumption of all biota within the Study Area.*"	
110	Section 7.1.2, page 106:	The text in this section should be revised to provide additional information regarding tissue concentrations in the WA DOE study and concentrations of similar fish in Portland Harbor, and to clarify whether the results are comparable based on whether the measurements are based on whole body or fillets with skin. If the results from the DOE study are presented as risk estimates, the calculations must be provided somewhere in the risk assessment. Delete the word "significant" from the last sentence.	Revise
111	Section 7.1.3, page 107:	The following statement occurs in the first paragraph: "*Depending on the species and chemical, the difference in concentrations between fillet and whole body tissue can be minimal or more than a factor of 10, as discussed in Attachment F5."* As discussed in our comments on Attachment F5, a table should be provided that shows data used and results that supports the conclusion (e.g., "*factor of 10"*) presented here. Analyses not reported in the risk assessment cannot be evaluated or approved by EPA.	Revise, clarify
112	Section 7.1.4, pages 107-108:	This section concludes that, **"***With the exception of a few metals, average chemical concentrations were higher in undepurated clam tissue collected at the Study Area than in depurated clam tissue*. The database for COPCs in depurated clam tissue is limited to 5 of the 22 clam samples, and these five samples are from the northern stretch of the river (1E and 2W) and the southern stretch of the river (10 W, 11E,	Issue

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		and 12 E). Hence, it is not evident that the results from these samples are representative of conditions from the entire length of the site from RM 1 to RM 12. At a minimum, the risk assessment should discuss the uncertainty associated with such a limited data set for depurated clam tissue, and present a balanced discussion of the appropriateness of extrapolating these limited results to represent tissue concentrations in more contaminated areas of the site.	
113	Section 7.1.5, page 108:	The text indicates that mercury concentrations were higher in bass fillet with skin, and that the reverse was true for carp where mercury concentrations were higher in fillet without skin. The report (either in this section or in Attachment F5) needs to present the data used for this analysis to allow the conclusion to be assessed.	Clarify
114	Section 7.1.6, pages 108-109:	The text states that, "*It should be noted that DLs were above ACGs for PAHs, and PAHs were not detected in Round 1 fish tissue. However, fish metabolize and excrete PAHs, and thus there is less likelihood for PAHs to bioaccumulate in fish. PAHs were detected in Round 3B fish tissue, as well as in Round 1, 2, and 3B shellfish tissue, indicating that data were sufficient to estimate risk from PAHs in both fish and shellfish tissue."* Include a brief discussion as to why the PAHs were not detected in Round 1 fish tissue but were detected in Round 3 fish tissue. Clarify how the non-detect data for individual cPAHs from the Round 1 tissue data were used in calculating EPCs.	Clarify
115	Section 7.1.6, pages 108-109:	Tables F2-7 through F2-13 in Attachment F2 show non-detect results greater than the maximum detection limit per exposure area for different medium, species, tissue type, and exposure area (only Study Area-wide results are shown). These non-detect data, which are extensive, and are in many cases much greater than the maximum detection limit, were excluded prior to calculation of EPCs. The uncertainty discussion in Attachment 5 should include an analysis of how use of these non-detect data above the maximum detect value	Issue

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		would have affected the risk characterization. A summary of that analysis should be included in a separate sub-section of Section 7.	
116	Section 7.1.9, page 110:	In the Executive Summary and in summary/ conclusion sections of this HHRA, the fact that risks from consumption of black crappie and bullhead fillet tissue likely underestimate the actual risks should be included as a part of the discussion. This underestimation occurs because these fillet samples were only collected in Round 1 and were not analyzed for PCBs, dioxin or furan congeners, as stated in the text.	Issue
117	Section 7.1.10, page 111:	Delete the last sentence of the second paragraph. The first full paragraph on page 111 discusses the results of PBDE analysis for sturgeon, salmon and lamprey done as a part of the ODHS study, and then performs a conservative risk calculation using maximum detected values for PBDEs. Although this is useful information for salmon, sturgeon and lamprey, it is not directly applicable to resident fish species (e.g., carp and bass) that tend to have higher levels of bioaccumulative compounds (like DDX, PCBs and dioxins/furans) than salmon, lamprey and sturgeon. Without resident fish data on PBDEs, the conclusion that PBDEs are unlikely to contribute to the overall risks is not defensible. The EPA Region 10 lab has recently completed analyses of PBDEs in selected samples of resident biota from the PH Round 3 sampling (20 carp samples (10 fillet and 10 rest of body), 38 bass samples (19 fillets and 19 rest of body), and 6 clam samples). This data was recently made available to the LWG.	Issue
118	Section 7.1.10, page 111:	No studies are cited to support the conclusion here that "*… if VOCs were present in tissue, VOCs would volatilize during cooking.*" Volatilization would be an important, albeit variable, factor for VOCs in fish and shellfish tissue, as would the potential production of toxic metabolites that may be retained in the fish tissues. This discussion should be revised by presenting empirical information regarding the potential, or lack of potential, for VOCs to accumulate in fish and	Revise

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		shellfish tissue. In addition, the discussion of TZW water loading to surface water should be replaced with the conclusions derived from the ARARs analysis to be presented in Section 6.	
119	Section 7.1.10, page 112:	The last sentence in the last paragraph of this section states that emerging contaminants are not related to CERCLA releases and the results of the BHHRA. While technically correct, the real issues from a human health perspective are (1) the potential (or lack thereof) for Portland Harbor sources to release unregulated chemicals, and (2) lack of data on which to base human health risk assessment. These issues should be discussed briefly in this section.	Clarify
120	Section 7.1.11, page 112:	Additional analysis of the uncertainty in eliminating N-qualified data should be discussed in this section. Samples that had N-qualified data cannot be reanalyzed at this point to confirm the N-qualified chemicals. Therefore, for biota COPCs that were eliminated because of N-qualified data, Attachment F5 should review the results of these N-qualified chemicals in abiotic media within the exposure areas for those biota (e.g., 1 mile for bass, 1 mile on either side of the river for clams) to show that these eliminated COPCs are not present in the abiotic media at levels that pose a risk to human health. A summary of this analysis should be included this section.	Clarify
121	Section 7.1.12, pages 112-113:	The following sentence should be modified as indicated: "*The home ranges for common carp~~, black crappie~~ and brown bullhead may be as large as the Study Area and possibly even larger, and the home range for bass ~~Is~~ may be larger or smaller than the ~~span from~~ the one ~~to seven~~ mile~~s~~ assumed in the HHRA. For example, bass may only reside on one side of a river mile reach instead of throughout the one mile reach on both sides of the river as assumed for the HHRA.*" The results of the ODFW study suggest that black crappie are unlikely	Revise

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		to have such a large home range as that suggested in the sentence and that bass can have a home range that is limited to only one side of the river within a river mile.	
122	Section 7.1.12, page 113:	The text does not present a complete discussion of composite samples. The issue is two-fold. First, subsamples need to be collected in a manner that is representative of the beach (e.g., grid, stratified random, etc.), and second, the area sampled should reasonably represent an exposure unit. Both of these issues should be discussed in this section.	Clarify
123	Section 7.1.12, page 113:	The statement that beach risks evaluated using composite samples are within the EPA acceptable range of 10^{-4} to 10^{-6} should not imply that they are acceptable, as the NCP's point of departure is 10^{-6}. Therefore, delete the last sentence or modify it to include actual cancer risk estimates for beaches that are above 10^{-6}.	Revise
124	Section 7.1.15, page 114:	Revise the text in this section to delete the reference that the COPC selection process biased the risk estimates for fish consumption relative to other pathways. The discussion fails to note that, by comparison, the screening process tends to underestimate overall risk.	Revise
125	Section 7.2.3, page 115:	Delete the following sentences: ~~*"As required by EPA Region 10, this BHHRA included exposure scenarios that are not well documented, so it is unknown to what extent exposures currently occur, if at all, within the Study Area. In addition, this BHHRA evaluated risks associated with a hypothetical future scenario, which is not anticipated to reasonably occur in the future based on current information for the Study Area. The uncertainties associated with these potential and hypothetical exposure scenarios are discussed in the following subsections."*~~ Consistent with EPA Superfund guidance, EPA and its partners chose only those scenarios that are reasonably anticipated to occur and are consistent with current statutory or regulatory requirements (e.g.,	Directed Change

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		designated beneficial use of the river as a source for drinking water).	
126	Section 7.2.3.1, pages 115-116:	The following sentence in the first paragraph should be deleted: "~~*However, there is no documentation of ongoing shellfish consumption by humans occurring in the Study Area, and the harvest or possession of Asian clams, which is the species assessed in this BHHRA, is illegal*~~." In addition, the following sentence in the last paragraph should be revised as shown: *"The evaluation of risks from shellfish consumption in this BHHRA is a ~~conservative~~ health protective approach.~~, as it is not known whether shellfish consumption actually occurs on an regular basis within the Study Area~~."* The rationale for these changes is provided below: The following comments were received from David Farrer from the Oregon Office of Environmental Public Health regarding consumption of crayfish: *"Our office has received information from ODFW indicating that an average of 4,300 lbs of crayfish were commercially harvested from the portion of the Willamette River within Multnomah County each of the 5 years from 1997-2001. Most of this catch was sold to the Pacific Seafood Company of Oregon. DHS also has information from local commercial crayfish harvesters indicating that Europe is a major portion of their market. Also, as part of the McCormick and Baxter assessment in 1991, Ken Kauffman in our office talked with Debbie Scott (503-631-2440) who is the wife of a licensed commercial crayfish harvester, and she served (at that time) as the secretary-treasurer of the Oregon Crayfish Association. She indicated that the area around McCormick and Baxter was a very productive crayfishery and that she*	Directed Change

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		and her husband had harvested there prior to the advisory on many occasions. In addition to this historical commercial crayfish harvesting information in the Lower Willamette, DHS also occasionally receives calls from citizens interested in harvesting crayfish from local waters who are interested in fish advisory information. Between 2001 and 2007, DHS fielded 8 calls from citizens who reported catching and eating crayfish from Portland-area waters (only one was specifically from the Study Area). We have no way of knowing what percent of individuals who catch and eat crayfish contact our office first to ask for fish advisory information. We estimate, however, that for each person who contacts us regarding the safety of consuming crayfish from the Lower Willamette, there are many more who catch and consume the animals without contacting our office. " Although the current consumption of crayfish is unknown, this is not relevant for the HHRA. Crayfish collection and consumption within the site is likely suppressed because of the crayfish advisory and knowledge that the harbor is a Superfund site. The effects of institutional controls, such as an advisory, are relevant in a baseline HHRA. In addition, the HHRA is to consider future use. Increased harvesting and consumption of crayfish from the site is perhaps even likely once remedial activities ease public concerns about contamination in the harbor. The Linnton Community Center project is not conclusive proof that clam consumption "*does not occur on an ongoing basis within the Study Area.*" As discussed in the HHRA, conversations were conducted with transients who are expected to live in the area for shorter periods of time than Portland area residents. Therefore, the Linnton information is only relevant for transients and does not provide information on clam consumption by permanent Portland residents. In addition, the fact that collection of Corbicula is illegal is relevant but	

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		not particularly important for the pathway in general. Indications are that Corbicula are being collected and consumed. More importantly, Corbicula are used as surrogates for bivalve consumption. It is reasonable to assume that bivalve consumption is a potential future exposure pathway and that low clam biomass that may limit current bivalve consumption does not apply to future exposures. Note also that the HHRA provides no discussion of productivity. If productivity is high, such that biomass is frequently replaced, biomass could be a less important issue currently.	
127	Section 7.2.3.2. page 116:	Modify this section to read as follows: "*Commercial diving companies in the Portland area were contacted to develop a better understanding of potential diver exposures within the Study Area. All of the diving companies that were contacted indicated that the standard of practice for commercial divers is the use of dry suits and helmets when diving in the LWR (Hutton 2008, Johns 2008, and Burch 2008). EPA Region 10 reported observing divers in wet suits and with regulators that are held with the diver's teeth within the Study Area, so a wet suit diver and associated ingestion for the "in the mouth" regulator exposure scenarios were included at the direction of EPA. Evaluation was also performed of helmet diving with use of a neck dam, which allows polluted water leakage into the diving helmet. Commercial divers as recently as 2009 have been observed using techniques to don a diving helmet which increase exposure (Sheldrake personal communication with RSS, 2009, DEQ, 2008). The observed wet suit divers were performing environmental investigation and remedial activities, which are not activities evaluated as part of a commercial diver scenario. Also, it is not known whether the individuals who were observed diving in wet suits on specific occasions are diving within the Study Area on a regular basis, as they do not work for the commercial diving companies in the Portland area. Recreational diving also takes place in Portland Harbor (Oregon*	Revise

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		Public Broadcasting Think Out Loud, "Are you going to swim in that?" August 22, 2008). Therefore, including a wet suit diver scenario with associated ingestion from use of a recreational type regulator, rather than a full face mask or diving helmet, and full body dermal exposure in this BHHRA (in addition to a dry suit diver scenario) is an appropriately health protective ~~conservative~~ approach given that commercial contractors continue to have difficulty in using appropriate personal protective equipment and decontamination procedures for Superfund and unrelated commercial work, and that recreational diving does continue to occur, exposing some divers to harbor contaminants."	
128	Section 7.2.3.3, page 116:	Replace "*Hypothetical*" with "*Potential Future*" in the title for this section. As described in General Comment 6, under OAR 340-041-0340, Table 340A, domestic water supply is a designated beneficial use of the Willamette River, with adequate pretreatment. CERCLA sets out a mandate for remedies that are protective for both private and public users of surface or groundwater. Surface water is potable and capable of serving as a potential drinking water source; thus, the expectation is that the resources will be protected and remediated to achieve such use (40 CFR 300.430(a)(1)(ii)(F)) in the absence of pretreatment. Therefore, the text in this section should be revised as indicated:" *Surface water in the LWR within the Study Area is not currently used as a domestic water source~~, nor are there plans to use surface water within the Study Area as a domestic water source in the future~~. According to the City of Portland, the primary domestic water source for Portland is the Bull Run watershed, which is supplemented by a groundwater supply from the Columbia South Shore Well Field (City of Portland 2008). ~~In addition, the Willamette River was determined not to be a viable water source for future water demands through 2030 (City of Portland 2008)~~. Under OAR 340-041-0340, Table 340A,*	Directed Change

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		domestic water supply is a designated beneficial use of the Willamette River, with adequate pretreatment. CERCLA sets out a mandate for remedies that are protective for both private and public users of surface or groundwater. Willamette River surface water is potable and capable of serving as a potential drinking water source; thus, the expectation is that the resources will be protected and remediated to achieve such use (40 CFR 300.430(a)(1)(ii)(F)) in the absence of pretreatment. The fact that surface water is not currently being used or that no one currently plans to use this resource is not justification for not attaining or using criteria to protect the river. *~~Even if the Willamette River were to be used as a domestic water source, which is not likely, that would only occur after adequate pretreatment to meet Safe Drinking Water Act standards and Oregon rules. Under OAR 340-041-0340 Table 340A, domestic water supply is a designated beneficial use of the Willamette River, but only with adequate pretreatment and natural quality that meets drinking water standards.~~* *Therefore, the evaluation of ~~untreated~~ surface water as a potential future domestic water source~~, even under hypothetical future conditions,~~ is a ~~conservative~~ health protective approach and consistent with EPA regulations and guidance.~~approach and is not an indication of current or reasonably anticipated future risks at the Study Area.~~"*	
129	Section 7.2.4, pages 116-117:	This section discusses uncertainties for complete but insignificant pathways that are not discussed elsewhere in the document. As discussed in previous comments, the pathway analysis should provide a justification for not quantifying risks for these pathways at the time the CSM is discussed, to provide the frame of reference for the uncertainty discussion. As is, the earlier parts of the document contain no explanation for the decision to eliminate pathways mentioned in this section.	Issue

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130	Section 7.2.5, pages 117-118:	Modify the first paragraph as shown: *"Assumptions about exposure factors typically result in ~~a high degree of~~ uncertainty in any risk assessment. ~~Because many of the exposure scenarios that were evaluated in this BHHRA are highly variable and do not have standard default exposure factors, uncertainties associated with the exposure factors are anticipated to have some of the greatest impacts on the risk estimates~~."*	Revise
131	Section 7.2.5, pages 117-118:	The suggestion that a lack of "*standard default exposure factors"* will result in an high level of uncertainty is unsupported. Standard default exposure factors provide national uniformity for risk assessments that are assessing similar exposure scenarios. In addition, default exposure factors (body weight, soil ingestion and drinking water rates) reduce the need for detailed site-specific exposure information to be collected at every site in that they reflect typical exposure patterns for a large segment of the population. There is no basis for the *a priori* assumption that exposure factors based on local practices and other site-specific information would provide substantially different exposure estimates than the use of default values. Unless specific information can be presented regarding alternate values, and how these alternate values would be expected to substantially differ from those used in the risk assessment, these statements should be deleted.	Issue
132	Section 7.2.5, pages 117-118:	Modify the 3rd sentence in the 2nd paragraph as follows: ***"****In the case of the scenarios assessing the use of untreated surface water as a domestic water source, both the RME and CT scenarios represent ~~hypothetical~~ potential future exposures."*	Directed Change
133	Section 7.2.5, pages 117-118:	Modify the 3rd paragraph as follows: *"For fish consumption, a range of ingestion rates ~~representing possible high end consumption scenarios~~ were used to evaluate ~~the impact of~~ variability on the risk estimates (see discussion of exposure parameters*	Directed Change

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		for tissue ingestion scenarios below). As recommended by EPA guidance, ~~T~~these ~~high-end~~ ingestion rates were used with EPCs calculated using both the mean and 95% UCL on the mean (or maximum concentrations for EPCs when sample size was less than 5), and thus the resulting risks in this BHHRA ~~do not necessarily~~ represent ~~the entire~~ a range of possible human health risks, including ~~but rather~~ estimates that might fall into the high end of those possible."	
134	Section 7.2.5.1, pages 118-119:	The text in this section focuses on whether all in-water sediments in the Study Area are used by the various receptors assessed in the draft HHRA. While this uncertainty is appropriate to address, the discussion misses the point of using an analysis by one-half mile segments. The information from this approach, both risks for specific in-water areas and the range of risk estimates for the LWR, can be used along with current and projected site use and chemicals posing potentially unacceptable risk to help focus the feasibility study. Further, the public can use the information for each one-half mile segment to help them choose among areas of the river to use. This concept also applies to beaches. These reasons for focusing on one-half mile segments should be added to this section. As indicated above, this discussion should dovetail with maps/figures that show how risks vary by one-half mile segment within the site, and should recall the need to provide the general public with risk information.	Issue
135	Section 7.2.5.2, pages 119-120:	Modify the following phrase in the 1st paragraph: *"the use of untreated water from the Lower Willamette as a source of drinking water by transients for 2 years ~~on an ongoing basis is highly unlikely~~ is assumed to be health protective."* The ED represents an assumption that a given transient will move on within 2 years, or leave and then return, and that 2 years of exposure would represent a high-end value. Unless the LWG can provide survey data that shows that transients do not commonly drink river water, the ED simply represents best	Revise

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		professional judgment and cannot be characterized as highly unlikely.	
136	Section 7.2.5.2, pages 119-120:	The following changes should be made in the 3rd paragraph in this section: *In addition to the direct contact scenarios mentioned above, risks were assessed from exposure to surface water as a ~~hypothetical~~ potential future domestic water source. This scenario assumes untreated surface water is used as a domestic water source ~~is drunk and bathed in~~ 350 days a year for 30 years (adult resident) or 6 years (child) ~~resident), using tap water ingestion rates~~. ~~As with the transient scenario, this scenario is equally unlikely for residents in the area.~~ The LWR within the Study Area is not currently used as a domestic water source, but could be used as such in the future ~~nor are there any future plans to use the LWR within the Study Area as a domestic water source.~~"*	Directed Change
137	Section 7.2.5.3 page 120:	Revise the first paragraph sentence to read as indicated: "*Fish tissue ingestion rates were developed using fish consumption data from a national study of fish consumption (CSFII, USDA), from a creel survey of Columbia Slough fishers north of the Study Area, and from the CRITFC Columbia River Fish Consumption Study (CRITFC) study ~~with variable exposure factors and environmental data that not site specific, or that are derived from anecdotal evidence~~. The CRITFC Fish Consumption Survey provides fish consumption data for the Columbia River Basin for four of the six tribes who are parties to the Consent Decree for the PH site. In addition, although the Columbia Slough Study was not done in PH and it likely underestimates fish consumption because of the way the fish consumption data were collected, the Columbia Slough is within one-half mile of the northern part of the PH site, so that it is reasonable to assume that fishers in the PH site may have similar fishing practices and fish consumption rates as those fishing in the Slough.*	Revise

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138	Section 7.2.5.3 page 120:	Modify the following sentence to read: *"The 90th percentile rate from the same study was used as the ~~high~~ <u>low</u> (17.5 g/day) ingestion rate for adult fishers in the BHHRA."*	Directed Change
139	Section 7.2.5.3, pages 120-121:	This section provides an incomplete and misleading analysis of the uncertainties associated with biota ingestion rates. As previously discussed, many inappropriate statements are made in this section and throughout the risk assessment regarding fish and shellfish consumption, including fish and shellfish consumption rates. These statements must be corrected in all instances.	Issue
140	Section 7.2.5.3, pages 120-122:	As previously discussed, EPA disagrees with the characterization of the 3 adult non-tribal fish ingestion rates used in this risk assessment as high (17.5 g/day), higher (73 g/day), and highest (142 g/day). These consumption rates should be referred to as low, medium, and high. There are other uncertainties in the fish consumption rates from the USDA study associated with regional, cultural and economic differences. For example, under-representation of peoples whose culture includes greater fish consumption would result in under-estimation of consumer-only consumption rates, particularly on a regional basis. Such biases could be exacerbated by regional differences in access to fishing resources and ability to pay for commercial fish in local stores, among others. For example, consumers in Louisiana could have access to large quantities of local crayfish, a resource not available to consumers in Colorado. Available data from the USDA study are based on a study sample of a few thousand people selected to be representative of the general population, which is unlikely to account for specific variability at a regional or local level. While the USDA study provides valuable data on fish consumption, the information may lack sufficient power to determine the direction of uncertainties relative to specific consumption rates for	Directed Change

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		fisher populations at the LWR.	
141	Section 7.2.5.3, page 121:	Delete the following sentence from the first paragraph on this page: ~~*"So, the use of high-end percentiles for all three ingestion rates in the BHHRA provides conservative estimates of reasonable maximum and central tendency exposures."*~~	Directed Change
142	Section 7.2.5.3, page 121:	Delete the following sentence: *"~~All three of the ingestion rates used for adult fishers in the BHHRA are higher than average fish ingestion rates reported from the respective studies.~~"* The ingestion rates used in this HHRA are not above average when consumer-only ingestion rates from the CSFII are considered. In fact, the language in the Uncertainty section discusses the fact that the ingestion rates of 17.5 and 142 g/day are much lower than the average of those rates for consumers only. Consumers represent an important subpopulation to be protected.	Directed Change
143	Section 7.2.5.3, page 121:	Delete or modify this sentence as shown: "*In addition to the uncertainties behind the rates of fish consumption, it was assumed that the frequency of consumption occurred at the same ingestion rate every day of every year for 30 years for the adult fisher scenarios."* The reference to consuming fish or shellfish "*every day of the year*" is misleading, as the values for ingestion of fish and shellfish represent annualized rates. For example, the rate of 17.5 g/day is equivalent to two 8-oz meals per month. Using a daily rate is a method to simplify the risk calculations, and does not imply that fish and shellfish are consumed on a daily basis.	Issue
144	Section 7.2.5.3, page 121: -	Modify the following sentence as indicated: *"Furthermore, 100% of the fish consumed was assumed to be caught <u>within a 1 mile stretch on both sides of the river for bass and within a 3 mile stretch on both sides of the river for crappie, carp and bullhead trout</u> ~~at the same location~~ over 30 years.~~, and n~~ <u>No</u> reduction in concentrations of contaminants during food preparation and cooking*	Revise

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		was assumed, <u>although reductions can occur depending on cooking and methods of preparation</u>." The focus on river miles for bass provides a range of possible risks for individuals that frequent one or several areas to fish, provides more spatially-specific information for use in the FS, and may allow members of the public to modify their fishing habits based on risk levels.	
145	Section 7.2.5.3, page 122:	Revise the text in the first full paragraph following the bulleted list as shown: "*The ~~same~~ CRITFC Fish Consumption Survey that was used as the basis for the tribal fish ingestion rate also indicated that none of the respondents fished the Willamette River for resident fish and at most, approximately 4% fished the Willamette River for anadromous fish. <u>However, future use of the site by tribal members may increase."</u>* Add the following sentence at the end of this paragraph: "*<u>It is important to note that ODEQ is proceeding to develop state water quality limits based on a tribal ingestion rate of 175 g/day."</u>* ODEQ's adoption of this consumption rate for their WQC should be discussed in the risk assessment, including this Uncertainty section, as support for the selection of 175 g/day as an appropriate fish consumption rate for tribal populations who regularly consume fish.	Revise
146	Section 7.2.5.3, pages 122-123:	The comments on Section 7.2.3.1 should also be addressed in this section. While some of the uncertainties in the shellfish consumption rates are appropriately addressed in this section, additional discussion should be included regarding the USDA study which relies on surveys on a national level. For most of the nation, access to local freshwater and estuarine shellfish is limited or non-existent. Thus, the national survey likely captures consumption based on commercial species (e.g.,	Note

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		shrimp), rather than those locally caught. It is difficult to make any firm conclusions that shellfish consumption rates used in the risk assessment are overly conservative for Portland Harbor. This conclusion is especially applicable for current exposure for crayfish and for potential future exposures for both crayfish and bivalves.	
147	Section 7.2.5.3, page 122**:**	Revise the text in the second paragraph following the bulleted list as indicated: "*However, it is not known to what extent shellfish consumption occurs~~, as there is no documentation of ongoing shellfish consumption by humans occurring in the Study Area~~.*"	Directed Change
148	Section 7.2.5.3, page 123**:**	Revise the following sentence in the first paragraph as shown: *Although fishers normally fish and/or collect those resources that are available in their area, it is not known to what extent fishers would substitute alternative local types of shellfish. ~~if the shellfish in the survey were not available~~*"	Directed Change
149	Section 7.2.5.3, page 123**:**	Delete the following sentence: *~~"However, for freshwater habitat only, which is the same as the Study Area, the mean nationwide shellfish consumption rate is 0.01 g/day; upper percentiles for freshwater shellfish consumption rates are not available."~~*	Directed Change
150	Section 7.2.5.3, page 123**:**	Delete or revise the following sentence to clearly note that daily consumption rates represent mathematical artifacts to account for annual rates: *"Shellfish consumption was assumed to occur at the same rate every day of every year for 30 years."*	Directed Change
151	Section 7.2.5.3, page 123**:**	Revise the following sentence as indicated: *"It is unlikely that the Study Area supports ~~shellfish~~ Corbicula*	Directed Change

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		populations large enough to supply the quantity of tissue needed to satisfy the~~se hypothetical~~ ingestion rates used in the HHRA." Also, add the following as the last sentence to this paragraph*:* *"However, it is reasonable to assume that bivalve consumption is a potential future exposure pathway at the rates used in the HHRA."*	
152	Section 7.2.5.3, page 123**:**	Revise the following sentence in the third paragraph as indicated: *"Because ~~some~~ risks associated with consumption of fish and shellfish ~~consumption scenarios~~ exceeded the NCP target risk range of 10^{-4} to 10^{-6} as well as the point of departure of 10^{-6}, uncertainties associated with fish and shellfish consumption could ~~impact~~ affect the decisions made in the FS. ~~conclusions of this BHHRA.~~"*	Revise
153	Section 7.2.5.4, page 123**:**	As discussed in the comments re: Attachment F5, it is not clear how the ranges (e.g., "*from 1 to 8 times" and "from 0.1 to 7 times*") were calculated. Provide a table here or in F5 that shows the data that were used for these comparisons, as well as the comparison results for both whole body and fish fillet. EPA cannot review and approve information that is not provided in the HHRA.	Revise, clarify
154	Section 7.2.6.2, pages 124-125**:**	It is not clear whether the text in the first paragraph refers to specific chemicals as a group or to individual sample results. Absent any clear, concise explanation of the process described here and the specific implications on risk and hazard estimates, the paragraph should be deleted from this section and from Attachment F5.	Clarify
155	Section 7.2.6.3, page 125:	According to the information presented in Attachment F5, the ratios between the maximum and minimum concentration values shown are less than 3. For in-water sediments, the ratios are less than 4. When comparisons are made within an exposure area for biota (which is the appropriate comparison, rather than Study Area-wide, given the heterogeneity in sources in PH), the vast majority of the ratios of the	Clarify

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		maximum EPCs to the mean are equal to or less than 2, and the remaining ratios are less than 4. EPA believes it is important that this information be presented in the main body of the risk characterization, as it shows that there are not major differences between risks calculated using the mean of the concentration data and those calculated using the maximum for individual exposure areas.	
156	Section 7.2.6.4, pages 125-126:	Adjustments for preparation and cooking can be important for assessing exposure. However, the issue is complex, and the overall effect on chemical concentrations is dependent on the chemical class of the contaminant and specific preparation and cooking methods. EPA guidance (EPA 2000) indicates that adjustments to exposure based on preparation and cooking should not be done in the absence of data and other information on local preferences for preparation and cooking for target populations such as native Americans or other ethnic groups. The overall effect of reduction based on cooking methods is typically less than 50 percent (EPA 2000). Uncertainties in this term seem unlikely to make a large difference in estimated risks. If reduction due to cooking methods is to be presented as an important uncertainty in risk results, the available data should be summarized, the uncertainties in applying these data to Portland Harbor discussed, and the possible effect of not including fish cooking methods put into proper perspective. This analysis should be presented in Attachment F5 and summarized here.	Issue
157	Section 7.2.6.6, page 127:	The text in the second paragraph states that *"The results for PCBs in whole body tissue samples analyzed for both PCBs as Aroclors and as individual PCB congeners were compared to evaluate the significance of correlations in order to evaluate the uncertainty associated with the use of Aroclor data. The correlation of the PCB Aroclor and PCB congener data were significant (compared to a probability value of 0.05) for all species evaluated (common carp, smallmouth bass, black*	Revise, clarify

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		crappie, brown bullhead, and crayfish).” This analysis is not presented in any part of the HHRA. The data, analyses, and results should be presented in Attachment F5, and should focus on biota within each exposure area rather than being site-wide.	
158	Section 7.2.6.6, page 127:	Delete the following text from the second paragraph: “~~*Windward (2005) analyzed fish tissue from the Lower Duwamish Waterway as PCB Aroclors and as individual PCB congeners. The PCB Aroclor data and PCB congener data were significantly correlated for both fillet and whole body tissue.*~~” The Duwamish Waterway data is not relevant to the PH study, as the site is not in freshwater and the species assessed were not the same as those in Portland Harbor. Only the data from Portland Harbor should be discussed.	Issue
159	Section 7.2.6.6, page 127:	The text in the 3rd paragraph states: “*However, for fillet tissue, Round 1 samples were analyzed for PCB Aroclors only, and Round 3 samples, which were collected for smallmouth bass and common carp, were analyzed for PCB congeners only. Because PCB congener data are available for smallmouth bass and common carp fillet tissue, cumulative risks for exposure to fillet tissue from ingestion include only the most recent tissue data for these two species*.” EPA did not agree to eliminate the tissue data from Round 1 for smallmouth bass and carp, resulting in the calculation of EPCs for these fillet samples using only data collected in Round 3. Attachment F5 should present an analysis that compares total PCBs calculated from Aroclors using the Round 1 fillet data to total PCBs calculated from congener analysis using Round 3 data for these 2 species. This should be done by exposure area, in addition to site-wide, and the results of the analysis should be summarized in this section.	Issue

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160	Section 7.2.6.7, page 128:	The last sentence states that *"According to these studies, the magnitude of uncertainty could be as much as a factor of ten."* Based on the limited information presented here, it appears 10 represented the maximum degree of variance. Additional information regarding the minimum and range from the cited studies should also be presented, as well as whether the information is relevant to the exposure media for which risk was characterized in the risk assessment. Data and analyses that are specific to the media and chemicals assessed at the PH site should be presented to justify the statement that the "*the magnitude of uncertainty could be as much as a factor of ten,"* as bioavailability is medium and chemical-specific.	Issue
161	Section 7.2.6.8, page 129:	Total cPAH and dioxin/furan TEQ should be added to Figure 7-1. Error bars should not extend below zero. Clarify whether the values on the west side were higher than on the east side, and thus no ratios of east to west side concentrations were less than 1.	Revise, clarify
162	Section 7.2.6.8, page 129:	Revise the last sentence in this section as follows: "*Therefore, the characterization of risk for bass in this risk assessment is a health protective estimate that is unlikely to underestimate risks~~. uncertainties associated with exposure areas for smallmouth bass likely overestimate risks and may impact the conclusions of this BHHRA when considering risks on a river mile basis."~~*	Directed Change
163	Section 7.3.1, page 130:	The language in this section indicates that EPA guidance, Assessing Susceptibility from Early-Life Exposure to Carcinogens (EPA 2005), was not used because it does not identify exposure factors for specific age classes. For the calculation of early life risks, the report multiplied the risk for B(a)P for the child recreational beach user by a factor of 3. Since the B(a)P risk for this receptor is 5×10^{-6}, the report concludes that even if this risk were three times higher, it would be within the target risk range of 10^{-6} to 10^{-4}. This calculation is inadequate in	Issue

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		representing the early life risks. Child receptors in the BHHRA other than child recreational beach user could potentially be affected by this calculation. Other child receptors that should have been considered are the child fisher, the child tribal fisher, the child consumer, and the child resident (though there are no mutagenic COPCs for the child resident). Early life risks should have been calculated for additional COPCs that may be mutagenic. For example, Table 5-86 for the child tribal fisher identifies dibenzo(a,h)anthracene as a COPC. This chemical is considered by EPA to be mutagenic, as are all other carcinogenic PAHs.	
164	Section 7.3.1, page 130:	The risk assessment compares the individual cancer risk of B(a)P to the 10^{-6} to 10^{-4} range. Total cumulative cancer risk from all carcinogenic PAHs should be evaluated instead.	Issue
165	Section 7.3.1, page 130:	The risk assessment incorrectly calculates the lifetime risk for the population by multiplying the risk for B(a)P by 3 to give the early life risk. To correctly determine the early life risk for a population with an average life expectancy of 70 years, the cancer potency should be weighted by a factor of 10 for exposures that occur from birth to 2 years of age, and by a factor of 3 for exposures that occur from 3 years to 16 years of age. The remaining exposure is weighted by a factor of 1. The risks associated with each of the three relevant time periods need to be summed to provide an overall estimate of cumulative risk.	Issue
166	Section 7.3.1, pages 131-132:	In the fifth sentence, revise the text to note that chromium VI is reduced to chromium III in an aqueous environment if an appropriate reducing agent is available. Further, the text here should more clearly note that EPA currently considers the carcinogenic potential of hexavalent chromium via oral exposure as “cannot be determined.” The text should also note that other Tier 3 sources of toxicity criteria (the New Jersey Dept of Environmental Protection and the California EPA) have derived quantitative dose-response criteria for evaluating the	Revise

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		cancer risks associated with oral exposures to hexavalent chromium.	
167	Section 7.3.5, page 132:	The third sentence should be revised to read: "*The studies did not find a conclusive association between PCB exposure and cancer; however they were limited by small sample sizes, brief follow-up periods, and confounding exposures to other potential carcinogens.*"	Revise
168	Section 7.4.2, page 134:	Delete the following text from the second paragraph: ~~*"In some cases, background concentrations correspond to risk estimates above the target risk thresholds established by EPA (i.e., cancer risk of 10^{-6} to 10^{-4}). This increases the uncertainty in estimating risks from fish or shellfish ingestion that are attributable to hazardous substance releases within the Study Area. For example, in the Columbia River Basin Fish Contaminant Survey, HIs were greater than 100 and cancer risks were as high as 2×10^{-2} for the highest tribal fish consumption rate (389 g/day) (EPA 2002c)."*~~ As previously discussed, no appropriate "background" data and risk results for biota are available to compare to the results in the PH HHRA. The Columbia River Basin Fish Contaminant Survey is not appropriate to be used for background comparisons.	Issue
169	Section 7.4.2, page 134:	Delete the 3rd paragraph: ~~*"The presence of PCBs in fish above the EPA target fish tissue concentration in the Willamette River Basin was evaluated using a watershed-scale model (Hope 2008). The model results suggested that atmospheric sources of PCBs could have yielded the concentrations observed in fish tissue. If the model results are correct, atmospheric sources of PCBs alone result in tissue concentrations that exceed the target risk level of 1 x 10-6 for fish consumption rates higher than 16 meals per month".*~~	Issue

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		This study does not represent "background" data.	
170	Section 7.5, page 135:	The following sentences should be deleted: ~~*"In estimating the risks in this BHHRA, the conservative assumptions were multiplied together, which magnifies the conservatism in the risk estimates."*~~ and ~~*"The cumulative effects of the numerous conservative assumptions made during this BHHRA are risk estimates that are likely higher, and potentially significantly higher, than actual risks that may exist within the Study Area."*~~	Directed Change
171	Section 8.0, page 137:	The second sentence in the first paragraph should be revised to read as follows: "*In addition, surface water and groundwater data were compared to EPA's MCLs and AWQC to identify those chemicals and locations where SW and GW are above these two ARARs.* ~~*evaluated as a potential source of contamination for biota that are consumed by humans, and TZW data were evaluated as a potential source to untreated surface water that would potentially be is hypothetically used as a domestic water source."*~~	Directed Change
172	Section 8.0, page 137:	Revise the first sentence in the second paragraph as follows: *"Populations evaluated in the risk characterization portion of the BHHRA were identified based on human activities that are known to occur now and/or which could occur in the future within the Study Area, ..."*	Revise
173	Section 8.0, page 137:	Revise the last bullet as follows: "~~*Hypothetical*~~ *Potential future resident –* ~~*Hypothetical direct*~~ *Future exposure to untreated surface water used as a domestic water source."*	Directed Change
174	Section 8.1.1, page 138:	Delete the following sentence in the first paragraph: ~~*"In estimating the risks in this BHHRA, the health protective*~~	Directed Change

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		~~*assumptions regarding fish consumption were multiplied together, which magnifies the overall conservatism in the risk estimates."*~~	
175	Section 8.1.1, page 138:	Revise the fourth sentence in the first paragraph as indicated: *"The cumulative effect~~s~~ of ~~numerous conservative~~ health protective assumptions made during this BHHRA are risk estimates that are potentially ~~significantly~~ higher than actual risks that may exist within the Study Area."*	Revise
176	Section 8.1.1, page 138:	All endpoint-specific HIs referred to for each scenario in this summary should be consistent with EPA General Comment 4.	Clarify
177	Section 8.1.1, page 138:	The summary discussions of each scenario in this section should provide more detail on the range of risk for each receptor. This discussion should be linked to the summary graphs described in our comments on Section 5, which provide spatial information on those pathways posing the greatest risks. These graphs would show the risk characterization results spatially for total cancer risks and for cancer risks and HIs for selected chemicals posing potentially unacceptable risk by exposure area.	Clarify
178	Section 8.1.1.1, pages 138-139:	Revise the first sentence to read as follows: "*Fish consumption risks were calculated for the adult and child non-tribal fish consumers, based on three different ingestion rates representing low, medium, and ~~a range of potential~~ high end consumption scenarios."*	Revise
179	Section 8.1.1.1, pages 138-139:	Delete or revise the text in the third sentence and in all subsequent text in this section and Section 8.1.1.2 as indicated*:* *"~~Fish consumption was assumed to occur at the same ingestion rate, every day of every year"~~* The reference to consuming fish or shellfish "*every day of the year*" is	Revise

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		misleading in that the fish and shellfish ingestion rates represent annual rates converted to average daily rates.	
180	Section 8.1.1.1, pages 138-139:	Revise the last sentence as indicated: *"It was assumed that all fish consumed were resident fish caught within the Study Area (*<u>*within a one mile area on both sides of the river for bass and within a 3 mile stretch of both sides of the river for crappie, carp and bullhead trout).*</u> ~~*a single exposure area for spatial scales smaller than the Study Area.*~~*"*	Revise
181	Section 8.1.1.1, pages 138-139:	In the last sentence in this section and the rest of Section 8, delete the phrase "*use of maximum detected concentrations as EPCs*", as this is not a major uncertainty when maximum EPC values are compared to mean values appropriately.	Revise
182	Section 8.1.1.2, page 139:	Revise the first sentence as follows: "~~*It is not known to what extent*~~ <u>*Current and potential future shellfish consumption rates for the site are not known.*</u> ~~*actually occurs, and there is no documentation of ongoing shellfish consumption by humans occurring in the Study Area.*~~"	Revise
183	Section 8.1.1.3, pages 139-140:	Modify the second sentence to read as follows: "*Each ½-river mile segment was considered a potential exposure area.*~~*,*~~ ~~*regardless of the feasibility or practicality of use of the area.*~~*"*	Revise
184	Section 8.1.1.3, page 140:	Delete the following text in this section and in other places it occurs in the BHHRA, as no data have been provided here or in any other part of this HHRA to justify the claim that the degree of uncertainty associated with bioavailability of chemicals in sediment could affect the risk estimates by a factor of 10. ~~*"The magnitude of uncertainty associated with the bioavailability of chemicals in sediment could be as much as a factor of ten. Given that*~~	Revise

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		~~*uncertainty associated with the bioavailability of chemicals in sediment could be as much as a factor of ten, it is probable that actual cancer risks are lower than the risk estimates, which did not account for bioavailability*.”~~	
185	Section 8.1.1.4, page 140:	Unless specific information is provided to support the assertion, delete the sentences in the last paragraph in this section regarding “*the factor of 10*” for bioavailability.	Revise
186	Section 8.1.2, Figures 8-2 and 8-4:	As noted in the general comments, all endpoint-specific HIs for each scenario presented in the summary should be evaluated based on the chemical(s)/endpoint combination resulting in the greatest hazard index. In addition, many endpoint-specific HI tables will be eliminated when only total HIs above 1 are segregated into endpoint-specific HIs. The titles “*Ranges for 95% UCL or Maximum Exposure*” should be changed to “*Ranges for RME Exposure.*” This comment, which has been made earlier in this comment set, should be applied throughout the document and its tables, figures and graphs when referring to the RME exposures and risks.	Revise
187	Section 8.1.3, pages 141-142:	The statement here that EPA does not recommend the use of data such as the N-qualified results overstates the actual recommendations presented in the guidance. In fact, EPA guidance recommends that when the identity of a chemical is uncertain, site history and other information should be used to establish whether there is reason to believe that the chemical may be present. As discussed in comments on page 112, Section 7.1.11, the list of chemicals presumptively identified in the Round 1 tissue samples should be compared to analytical results from sediment samples collected within the exposure areas related to the tissue samples (e.g., 1 mile for bass, 1 mile on either side of the river for clams) as a means to determine whether there is reason to presume that chemicals for which the results are N-qualified are likely to be present in the tissue samples. If these analytes	Issue

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		are not present in the sediment at concentrations that present a risk to human health, they may be excluded as PRGs.	
188	Section 8.1.3, pages 141-142:	The list of chemicals in Table 8-1 must include all of those chemicals that resulted in a cancer risk greater than 10^{-6} or an HQ greater than 1, with the exception of those chemicals that present a risk to human health based only on N-qualified data.	Revise
189	Section 8.1.3, pages 141-142:	Additional columns and chemicals will need to be added to Table 8-1 for surface water and groundwater, as described below. The conclusions from the ARAR evaluation in Section 6 should be included when discussing chemicals posing potentially unacceptable risk in Section 8.1.3, and Table 8-1 should be modified as discussed in Section 6.	Revise
190	Section 8.1.3, pages 141-142:	Table 8-1 should revised to include an additional abbreviation for those scenarios/chemicals that exceed a cancer risk of 10^{-5}. The abbreviations for exceedances of 10^{-6} (X) and for exceedances of 10^{-4} (#) should remain. Cells where any endpoint-specific HI is above 1 for at least one BHHRA scenario should be shaded.	Revise
191	Section 8.2, pages 142-150:	The role of the BHHRA is to identify potential exposures and risk to human health. The risk characterization step should summarize the major risk estimates calculated, the assumptions and the extrapolations made during the estimated risk calculation, and the residual uncertainties and their impact on the range of plausible risk estimates. It is not the role of the BHHRA to focus on a subset of the chemicals posing potentially unacceptable risk based upon the considerations listed on pages 142 and 143, which include the relative percentage of each chemical's contribution to the total human health risk, uncertainties associated with exposures, frequency of detection (localized and study-area wide), comparisons of Portland Harbor site risk to risks in "regional" studies, or the magnitude of risk exceedance above 10^{-4} to 10^{-6}. These represent risk management issues, and as such	Directed Change

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		are beyond the scope of the BHHRA. Accordingly, Section 8.2 should be deleted and Section 9, Conclusions, and the Executive Summary should summarize chemicals posing potentially unacceptable risk and exposure scenarios as defined by cancer risk greater than the 10^{-6} point of departure level and non-cancer hazard endpoint-specific HIs greater than 1, as well as chemicals that exceed ARARs based on the comparison to be completed in Section 6.	
192	Section 9.0, page 151:	In addition to summarizing estimated risks by exposure scenario and the primary contributors to the risk estimates, this section should include a discussion of surface water data relative to WQC and MCLs from Section 6. The text should reference Table 8-1, and provide summary information for all chemicals posing potentially unacceptable risk in the scenarios listed in the table. Each chemical should be listed for each scenario with their corresponding cancer risk and/or HI values. A discussion that focuses on chemicals and exposure scenarios that have the highest risks can then be included. For chemicals that exceed ARARs based on the evaluation presented in Section 6, the conclusions section should briefly explain the basis for the selection.	Revise
193	Section 9.0, pages 151-152:	Revise the text in this section as indicated: a) Delete the following sentence from the first bullet: "~~*However, there is no information documenting whether shellfish consumption actually occurs on an ongoing basis within the Study Area*~~." b) Revise the second paragraph by deleting the indicated text: "~~*While it is not probable that the maximum values of the uncertainties apply for every tissue consumption exposure scenario and chemical, this magnitude of uncertainty needs to be considered relative to the maximum cancer risks and noncancer hazards presented in this BHHRA and indicates that risks may actually be*~~	Directed Change

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		~~*less than 10^{-4} (excess cancer risk) or HI of 1 for certain scenarios.*~~" c) Delete the text in the fourth bullet as indicated: ~~*"On a regional basis, risks from exposure to bioaccumulatives in tissue exceed EPA target risk levels. For example, the PCB concentrations detected in resident fish from the Willamette and Columbia Rivers are approximately 20 to 100 times higher than the EPA target fish tissue concentration, which is based on a target risk level of 10-6, when adjusted for the ingestion rates used in this BHHRA"*~~.	
194	Attachment F2, Section 2.2, page 3:	Screening for COPCs was performed using only the in-water sediment data and surface water data from within the Study area. Data outside the study area were not included. However, the risk characterization was performed using both data sets. EPA did not agree to this elimination of the data outside the study area from the COPC screening. The Uncertainty section should contain analyses showing whether COPCs were eliminated from the BHHRA as a result of eliminating these data during the COPC screening step.	Issue
195	Attachment F2, Section 3.2, pages 11-14:	Additional discussion and analysis are needed regarding the exclusion of the PCB congener data from the in-water sediment samples collected by the City of Portland for its outfall sediment investigation. These samples were excluded because of insufficient congener data (<100 PCB congeners for total PCBs, and <12 congeners for PCB TEQ) to calculate a summed total PCB congeners and total PCB TEQ. It is not clear if the 85 in-water sediment samples were excluded because the no congener analysis was conducted or because the detection limits were too high. Consistent with EPA guidance, non-detect data where the detection limit is greater than the maximum detected value should only be excluded when their inclusion results in the calculated EPC to be greater than the maximum detected concentration. In either instance, the overall effect on the in-water sediment COPC selection process and	Issue

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		EPC calculations should be discussed.	
196	Attachment F2, Section 6.1, page 17:	Further explanation is needed why the 95 percent UCL on the mean was used for an EPC, even in instances when ProUCL recommended using alternate values, such as the 99 percent UCL. This discussion should include the specific EPCs for which the 95 percent UCL was selected when other values were recommended, and the overall effect on cancer risk and non-cancer hazard estimates in the HHRA. Unless sufficient justification can be provided, risk and hazard estimates for these chemicals may need to be revised.	Issue
197	Attachment F2, Tables F2-8 through F2-13:	These tables present non-detect sample results where the reported detection limit is greater than the maximum detected values for the chemical in each medium/exposure medium/exposure point. These results are briefly discussed in the Uncertainty section of the main body of the risk assessment (Section 7.2.6.2), but not in Attachment F5. EPA guidance notes that non-detect values for which the detection limit is greater than the maximum reported concentration for a specific chemical/media should be excluded when inclusion of the data results in a calculated EPC that exceeds the maximum reported concentration. However, it appears the LWG has made an *a priori* decision to uniformly exclude these data without an analysis of what effect their inclusion would have on the quantitative risk assessment. A more thorough quantitative analysis of the treatment of these data should be included in Attachment F5 for all medium/exposure medium/exposure points, particularly including results for surface water and in-water sediments where the ratio of the non-detected concentrations above the maximum detected concentrations approached two orders of magnitude. A summary of the results from F5 should also be included in Section 7.2.6.2 of the main body of the risk assessment.	Revise, clarify
198	Attachment F5, Section 1, page	Delete the last sentence: "~~*While the maximum values of the uncertainties presented below do not*~~	Directed Change

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	1:	~~*apply to every exposure scenario and chemical, the magnitude of each uncertainty indicates that risks in the BHHRA may underestimated since, or more likely overestimate risks for certain scenarios, particularly exposure to PCBs from consumption of fish*~~."	
199	Attachment F5, Section 2.1, page 1:	This section should present the data to support the conclusions regarding contaminant levels in whole body versus fillet samples. It should also include a discussion noting that differences between fillet and whole body samples also depend upon the manner in which the fillet is separated from the rest of the fish. If a lot of belly fat or other fat is left on the fillet, the distinction between the fillet and whole body samples would be substantially decreased. Per the e-mail from Laura Kennedy on January 21, the following sentence should be revised as shown: "*Whole body concentrations were calculated from these results on* ~~*an organic carbon- weighted*~~ *a weighted-average basis, which provided the opportunity to compare concentrations of chemicals in the fillet tissue* with concentrations in the whole body tissue for the same fish tissue sample.*"*	Issue
200	Attachment F5, Section 2.3, page 3:	The discussion of fish consumption rates presented in this section adds no useful information and should be revised to include more information about the range of potential fish consumption rates. The purpose of using a range of fish consumption values for fishers in the HHRA was to present the range of cancer risks and non-cancer hazards that might occur for low to high consumers of fish taken from PH. In addition, the discussion in this section is biased towards demonstrating how risk may be overestimated, rather than presenting a balanced presentation that includes rationale for the possibility that risks may have been underestimated as well. The discussion in this section should include comparisons with consumption rates higher than those used in the HHRA. For example, it would be appropriate to provide a	Revise

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		comparison of the 142 g/day rate (for both consumers and non-consumers) used in the HHRA to the comparable consumption rate of 509 g/day for consumers only from the same CSFII study, and to indicate that risks for adult non-tribal fishers may have been underestimated by a factor of 4. A similar comparison should be made for non-tribal child consumers using comparable consumption rates. Simply presenting a calculated mean and an upper percentile value provides the user with little useful information regarding the distribution and variance of the data. Given that remedial Superfund risk assessments are intended to present an estimate of risks towards the upper end of the probable distribution, these discussions provide no useable alternative descriptors of plausible, alternate upper-percentile values on which to base the RME evaluations.	
201	Attachment F5, Section 2.4, page 4:	It is not clear how the ranges in risk estimates presented in this section are calculated. Please provide information that shows the specific data used for these comparisons.	Clarify
202	Attachment F5, Section 2.4, page 4:	Revise the last sentence as shown: "*This indicates that assuming an individual consumes only a single species of fillet tissue could over estimate risks by a factor of up to 7*." to "*This comparison indicates that cancer risks for an individual who consumes only a single species of fillet could be higher by a factor of 0.1 to 7, depending on the species, than an individual who consumes a multi-species diet*."	Revise
203	Attachment F5, Section 2.5, page 4:	This section requires either complete revision or it should be deleted. The discussion here referring to the uncertainty associated with the 95 percent UCL is incorrect. The 95 percent UCL represents a one-sided confidence limit. By definition, setting the confidence interval at 95 percent (p=0.05), the calculated UCL will be equal to or greater than the true mean 95 percent of the time. The uncertainty and statistical power of calculating the value remains constant regardless of the	Issue

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		sample size. In addition, it is not clear how the fact that individual exposure point EPCs for Brown Bullhead and Common carp differed from the respective Study Area-wide EPCs by a factor of 2 represents an uncertainty, rather than simply an acknowledgement of localized heterogeneity of contaminant concentrations across such a large area.	
204	Attachment F5, Section 2.6, page 5:	Revise this sentence as shown: "*Except for the EPC calculated for location 7W for clams, ~~F~~for the calculation of all shellfish station tissue EPCs, the maximum concentrations were used because fewer than five composite tissue samples were collected per station.*"	Revise
205	Attachment F5, Section 2.4, page 4:	Delete the outlier test for shellfish described here and presented in Table 5-2. It is not clear why this test is being done, given the large heterogeneity in sources in PH. The fact that the result from a particular location differs markedly from other results provides no useful information without any additional spatial context or information regarding related chemical concentrations in sediment and pore water. Ultimately, the test does not provide any clarification to the uncertainty being addressed in this section, as stated in the text: "*The outlier tests provide information on the spatial variability of risk estimates for which the maximum concentration was used though do not decrease the uncertainty associated with using the maximum concentrations to estimate risks.*"	Issue
206	Attachment F5, Section 2.6, Tables 5-3, 5-4, and 5-5:	Additional information and discussion should be included for the results in Tables 5-3, 5-4, and 5-5, which show the comparison between the maximum to mean concentration values in surface water, in-water sediments, and biota. For example, it is assumed that the maximum values shown in the tables are limited to those chemical/exposure media where the maximum value was used as the	Issue

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		EPC to calculate risk for that chemical/exposure media. If the cancer values shown from biota correspond to those from the highest ingestion rate (142 g/day) for adult non-tribal fishers, and the non-cancer HIs correspond to the highest ingestion rate for non-tribal children, this should be clarified in the text and tables. The discussion of the results for each table should be presented separately, rather than stating that, "the ratios of the maximum concentrations to the mean concentrations are generally within an order of magnitude." For surface water (Table 5-3), almost all of the ratios between the maximum and minimum concentration values shown are less than 2. Only at RM 6 (west) for B(a)P, which at 2.7, is the ratio greater than 2. Ratios for in-water sediments (Table 5-4) are typically less than 3, and all ratio are less than 4. When comparisons are made within an exposure area for biota (which is the appropriate comparison rather than an area-wide comparison, given the heterogeneity in sources in PH) the vast majority of the ratios for biota (Table 5-5) are equal to or less than 2, and none exceed 4. These results are important to discuss here and in the main body of the risk characterization, as they reveal that there is little difference in the risks calculated using the mean of the concentration data and those calculated using the maximum, and that this is not a major source of uncertainty.	
207	Attachment F5, Section 2.7, page 6:	The discussion of possible adjustment factors in this section presents an incomplete and misleading discussion of the potential reduction of contaminant concentrations in cooked versus uncooked fish tissues. The overall reduction will vary depending on preparation and cooking methods, as well as being chemical-dependent. The section should discuss the range of reduction factors and note that preparation methods such baking, broiling, and grilling have been associated with only modest reductions in contaminant concentrations. An appropriate conclusion for the assessment is that unless preparation and cooking methods are known for populations of interest, sport anglers, tribal	Issue

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		fishers, etc., the overall uncertainty is unknown, and the overall effect may in fact be much more modest than the 87 percent cited.	
208	Attachment F5, Section 2.8, pages 6-7:	Modify the first sentence as follows: "*Studies have shown that conditions in environmental media (e.g., pH, organic carbon content) can affect the bioavailability of a chemical (Ruby et al. 1999, Pu et al. 2003, Saghir et al. 2007)* ~~*by a magnitude of up to ten.*~~" It is not clear what media (abiotic or biotic) or to which chemicals this "factor of ten" is supposed to apply. As bioavailability is chemical-, media-, and exposure route-specific, and given that there is no site-specific information on bioavailability for the PH site, no rationale for using the generic statement that uncertainty "by a magnitude of up to ten" exists, and none can be provided by citing literature data.	Issue
209	Attachment F5, Section 2.9, page 7:	This section is misleading and should be modified. The EPA document titled Cancer Dose-Response Assessment and Application to Environmental Mixtures (EPA/600/P–96/001F, September 1996) presents the rationale for the use of 3 different cancer slope factors for PCBs. Three slope factors are provided: 2 per mg/kg-day for high risk and persistence PCBs, such as Aroclor 1260 and 1254; 0.4 per mg/kg-day for low risk and persistence PCBs, such as Aroclor 1242; and 0.07 per mg/kg-day for lowest risk and persistence PCBs, such as Aroclor 1016. The high risk and persistence value should be used for those exposure pathways associated with environmental processes that tend to increase risk, including: food chain exposure; sediment or soil ingestion; dust or aerosol inhalation; dermal exposure (if an absorption factor has been applied); the presence of dioxin-like, tumor-promoting, or persistent congeners in other media; and early-life exposure (all pathways and mixtures). The low risk and persistence value should be used for those exposure pathways that tend to decrease risk, including: ingestion of water-soluble congeners, inhalation of evaporated	Issue

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		congeners, and dermal exposure if no absorption factor has been applied. The lowest risk and persistence value should be used where congener or isomer analyses verify that congeners with more than four chlorines comprise less than one-half percent of total PCBs, suggesting that potency is best represented by the least potent tested mixture. All of the pathways assessed in the HHRA are included under the criteria for use of the high risk and persistence cancer slope factor of 2 per mg/kg-day. Even for scenarios where adults only (not children) ingest water, the lower cancer slope factor (0.4 per mg/kg-day) should not be used, as risks are calculated using surface water data that would contain both water soluble congeners and those found in water-borne colloidal material and particulate matter.	
210	Attachment F5, Section 2.10, page 7:	Please add data and a table to support the conclusions that "*The differences ranged from a ratio of 1 to 700 for noncancer hazards, and 1 to 400 for cancer risks*."	Issue
211	Attachment F5, Additional Uncertainty Discussions:	For balance and completeness, the discussion of uncertainties in this section should also include the following: a) <u>Limiting Endpoint-Specific HIs for a Chemical to One Endpoint</u>: In deriving endpoint-specific HIs, only one health endpoint is used for each chemical, even though most chemicals can have a myriad of health effects as exposures increase. While the individual HQ for additional effects will be lower than that based on the critical study, not considering these additional endpoints may underestimate the potential for adverse effects. For the chemicals that have the largest non-cancer contribution in the HHRA, the uncertainty section should discuss the possibility of under-predicting non-cancer health impacts by using only one endpoint per chemical, and any supporting analyses should be included in Attachment F5. b) <u>Uncertainties Resulting from Elimination of Exposure Pathways in the draft HHRA</u>: The risk assessment should provide a more	Clairy, revise

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		complete pathway analysis, which is a critical aspect of the process. Section 3.2.1 initially describes different categories for exposure pathways (complete, incomplete, complete and significant, etc.), but subsequent discussion focuses only on those pathways quantified in the risk assessment. All pathways should be discussed and justification provided for placing pathways into the various categories. The potential for underestimating risk by not evaluating those pathways considered complete but insignificant should be addressed in Attachment F5. c) Elimination of Data from Outside the Study Area in Screening for COPCs in In-water Sediments and Surface Water: During the screening for COPCs described in Section 3, data from outside the Study Area were not used for in-water sediments or for surface water. The Uncertainty section should include a screen of these data that were excluded to show that additional COPCs would not have been selected for these two media. d) Exclusion of Non-Detected Concentrations that Are Higher Than the Highest Detected Concentration: Tables F2-7 through F2-13 in Attachment F2 show non-detect data that are greater than the maximum detection limit per exposure area for different media, species, tissue type, and exposure area. There are a substantial number of non-detect results, and in many instances the detection limit is much greater than the maximum detected concentration for the respective analytes. These data were excluded from the calculation of EPCs. The uncertainty discussion should include an analysis of the effect of excluding these non-detect data when calculating EPCs, and how their inclusion may have affected the risk characterization results. e) Uncertainties in the Dermal Toxicity Assessment: The approach used to evaluate dermal risk could underestimate risk by a factor of	

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		up to 2, since no adjustments to slope factors or RfDs are required if oral absorption efficiency is greater than 50 percent. f) Comparison of Undepurated and Depurated Clam Samples: Data and calculations used for these analyses should be included in this Attachment and summarized in the Uncertainty section. Conclusions from this comparison should be limited to the 5 sampling sites where data from depurated and undepurated samples are available. g) Polychlorinated Biphenyls: The text in Section 7.2.6.6 describes an analysis of the correlation of the results of whole body tissue samples for PCBs as Aroclors and as individual congeners. This analysis is not presented in any part of the HHRA. The details of this analysis should be presented in Attachment F5 for bass and carp, and should focus on biota within each exposure area rather than only on a site-wide basis. According to Section 7.2.6.6, fillet tissue samples collected in Round 1 were analyzed for Aroclors only, and Round 3 samples (smallmouth bass and common carp) were analyzed for PCB congeners only. EPA did not agree to eliminate the tissue data from Round 1 for smallmouth bass and carp fillet. Attachment F5 should contain an analysis that compares the total PCBs calculated from Aroclors using the Round 1 fillet data to the total PCBs calculated from congener analysis using Round 3 data for these two species by exposure area as well as on a site-wide basis. These analyses should be included in Attachment F5 and summarized in Uncertainty section of the main body of the BHHRA.	